Site: KOPPERS CO. INC.
Break: 8.6
Other: V.3

Five Year Review Report

Second Five Year Review
for the
Koppers Co., Inc (Charleston Plant) NPL Site
Charleston, Charleston County, South Carolina

June 2008

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DATE: 6/4/08

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LIST OF ACRONYMS

AOC	Administrative Order on Consent
BLS	Below Land Surface
BRA	Baseline Risk Assessment
BTEX	Benzene Toluene Ethylbenzene Xylene
CCA	Copper Chromium Arsenate
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act
CEMP	Comprehensive Environmental Monitoring Plan
CKD	Cement Kiln Dust
ESC	Engineered Soil Cover
ESD	Explanation of Significant Difference
EPA	Environmental Protection Agency
FS	Feasibility Study
FTA	Former Treatment Area
GPM	Gallons Per Minute
HDPE	High Density Polyethylene
HRS	Hazard Ranking System
LDR	Land Disposal Restriction
MNR	Monitored Natural Recovery
MW	Monitoring Well
NAPL	Non Aqueous Phase Liquid
NCP	National Contingency Plan
NPL	National Priorities List
NGVD	National Geodetic Vertical Datum
O&M	Operation & Maintenance
OCRM	Ocean & Coastal Resource Management
OIA	Old Impoundment Area
ORC	Oxygen Releasing Compound
PAH	Poly Aromatic Hydrocarbon
PCOR	Preliminary Close Out Report
POTW	Publicly Owned Treatment Works
PRP	Potentially Responsible Party
PVC	Poly Vinyl Chloride
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RAZ	Remedial Action Zone
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SCDHEC	South Carolina Department of Health & Environmental Control
SI	Site Inspection
S/S	Solidification/Stabilization
TEQ	Toxicity Equivalent Quotient
UAO	Unilateral Administrative Order
UCS	Unconfined Compressive Strength

EXECUTIVE SUMMARY

The Superfund Division within the Region 4 Office of the United States Environmental Protection Agency (EPA) has conducted the second Five-Year Review of the approved remedy implemented at the Koppers Co., Inc. National Priorities List (NPL) site in Charleston, Charleston County, South Carolina. The first Five-Year Review for this site was approved on January 10, 2003.

The site is approximately 102 acres in size, and is located in the neck area of northern Charleston on the west side of the peninsula formed by the Ashley and Copper Rivers. The current use of the area surrounding the site to the north, south, and east consists of a mixture of industrial, commercial and residential properties. The site has been employed for a variety of industrial uses since the early 1900's. From 1940 to 1978, the Koppers Company operated a wood-treatment facility on approximately 45 acres of the site that is generally bounded on the north by Milford Street, on the south by Braswell Street, on the east by the King Street Extension, and on the west by the Ashley River. Wood-treatment activities primarily consisted of treating raw lumber, utility poles and railroad cross-ties with creosote. Pentachlorophenol and copper chromium arsenate (CCA) were also used as wood preservatives for a short period of time. The bulk of wood treatment activities were conducted in the eastern portion of the site, near what is now Interstate 26.

An Interim Action Record of Decision (ROD) was issued by EPA in March 1995. The Interim Action ROD was a source control effort designed to eliminate off-site migration of non-aqueous phase liquid (NAPL) via surface water conveyances and shallow groundwater in close proximity to the former wood treatment area. The Final site-wide remedy was issued by EPA in an April 1998 ROD. The Final ROD was a multi-media response action that selected remedies for surface/subsurface soils, sediments of drainage ditches, groundwater and NAPL, surface water, contaminant transport pathways, and sediments within the Ashley River, barge canal, and north/south/northwest tidal marshes. Two Explanation of Significant Differences (ESD) have been issued to the April 1998 ROD. An ESD was issued in August 2001 that changed the Ashley River remedy from enhanced sedimentation to placement of an engineered, subaqueous cap. In April 2003, an ESD was issued for the barge canal and northwest corner of the site. This ESD changed the barge canal remedy from placement of an engineered, subaqueous cap to natural deposition and monitored natural recovery; and changed the groundwater/NAPL component for the northwest corner from active NAPL recovery with extraction wells, to immobilization using stabilization and solidification techniques.

The various remedy components were implemented and constructed via three primary mobilization efforts conducted in February 1999 for site soils and drainage ditch sediments, June 2001 for the Ashley River sediments, and March 2003 for the south tidal marsh and NAPL/groundwater. The net present worth of the remedy implemented at the site was estimated at $20.4 Million, and generally included the following components:

- Excavation of 22,000 tons of soil with off-site disposal in a Subtitle C landfill;
- Placement of a protective engineered soil cover over approximately 40 acres;
- Reconstruction of approximately 3,600 linear feet of surface water drainage ditches to eliminate contaminant transport pathways;

- Excavation of 1,500 tons of sediment and restoration of an estimated 1,300 linear foot reach of the tidal creek in the north marsh;
- Excavation of 2,500 tons of sediments and restoration of an estimated 2 acre area of the south tidal marsh;
- Placement of a geotextile/12 inch sand cover, and a cement-stabilized cap over 3 acres of the Ashley River;
- Monitored Natural Recovery (MNR) for the 3.2 acre barge canal;
- In-situ bioremediation for the northwest tidal marsh, and portions of the south tidal marsh;
- Solidification/stabilization of a 17,500 square foot area in the northwest corner of the site to immobilize residual NAPL; and
- Active groundwater and NAPL recovery via extraction wells in the former treatment area and old impoundment area.

The Final Remedial Action report was submitted in August 2003 and approved by EPA in September 2003. The site reached construction completion status with approval of the Preliminary Close Out Report (PCOR) on September 25, 2003. Full scale NAPL and groundwater recovery via extraction wells has been conducted in the former treatment area and old impoundment area since October 2003. Quarterly Operation and Maintenance (O&M) reports on the performance of the recovery system have been submitted since the first quarter of 2004. To date, an estimated 8,100 gallons and 6,200 gallons of NAPL have been recovered from the former treatment area and old impoundment area, respectively.

In the third quarter of 2003, Ashley LLC purchased a majority of the site from Beazer East (Koppers site PRP). The former Koppers site is now part of a 218 acre tract that Ashley has acquired and plans to redevelop as the Magnolia project. Magnolia will be a mixed-use development that will include approximately 3,000 to 4,000 residential units, 1 to 2 million square feet of commercial/retail use, over 500 hotel rooms, and 200,000 square feet of civic space. Construction on the initial phases of Magnolia is expected to begin in the Spring/Summer of 2008. EPA continues to work closely with the Magnolia project team to ensure that the development activities are properly integrated with the completed remedy components, and the ongoing O&M activities.

The remedy implemented at the Koppers Co., Inc. site in Charleston, SC is currently considered adequately protective of human health and the environment; and human health and ecological exposure pathways that could result in unacceptable risks are being controlled.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION

Site name *(from WasteLAN)*: **Koppers Co., Inc. (Charleston Plant)**

EPA ID *(from WasteLAN)*: **SCD980310239**

Region: 4	**State: SC**	**City/County: Charleston/Charleston**

SITE STATUS

NPL status: ☒ Final ☐ Deleted ☐ Other (specify)

Remediation status (choose all that apply): ☐ Under Construction ☒ Operating ☒ Complete

Multiple OUs? ☐ YES ☒ NO | **Construction completion date: 09/25/03**

Has site been put into reuse? ☒ YES ☐ NO

REVIEW STATUS

Lead agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency

Author name: Craig Zeller, P.E.

Author title: Remedial Project Manager | **Author affiliation: US EPA R4 – Superfund Div.**

Review period: 8/29/07 through 5/30/08

Date(s) of site inspection: 12/12/07 & 12/13/07

Type of review:

☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion

Review number: ☐ 1 (first) ☒ 2 (second) ☐ 3 (third) ☐ Other (specify)

Triggering action:

☐ Actual RA Onsite Construction at OU# ☐ Actual RA Start at OU# 1
☐ Construction Completion ☒ Previous Five-Year Review Report
☐ Other (specify)

Triggering action date *(from WasteLAN)*: **01/10/03**

Due date *(five years after triggering action date)*: **01/30/08**

Five-Year Review Summary Form continued

Issues:

1) It appears that operation of the shallow NAPL recovery system in the Old Impoundment Area may be contributing to observed increases in constituent concentrations in MW-102A located adjacent to the barge canal. Additional soil borings, piezometers, and groundwater samples were collected in December 2007 to further characterize the subsurface conditions in the Old Impoundment Area. A summary report is expected in Summer 2008.

2) Subsequent to the 2 year NAPL/Groundwater Performance Evaluation Report, field evaluations are underway in the Former Treatment Area to enhance NAPL recovery at several areas within the capture zone.

3) The Koppers site is now part of a 218 acre tract that will soon be redeveloped as the Magnolia project, a mixed use project that will incorporate future residential, commercial, retail, and civic land use. Construction on the initial phases of Magnolia is expected to begin in the Spring/Summer 2008. While institutional controls currently limit residential land-use on parcels formerly owned by Beazer, some modifications to the institutional controls may be warranted at some point in the future.

Recommendations and Follow-up Actions:

1) Continue to monitor, operate and maintain the NAPL and groundwater recovery systems in accordance with the revised plans. Implement follow-up actions recommended in supplemental Old Impoundment Area investigation report, and other reports as they relate to improving efficiency of NAPL recovery wells.

2) Continue annual monitoring of the Ashley River subaqueous cap.

3) Continue to inspect and maintain engineered soil cover and drainage ditches while the construction of the Magnolia development is implemented. The Hagood Avenue drainage ditch needs to be cleaned out.

4) Discontinue sediment quality and vegetation encroachment monitoring in the barge canal.

5) Continue to work closely with the Magnolia project team to ensure that future redevelopment activities are properly integrated with the completed remedy components, and the ongoing O&M activities.

Protectiveness Statement(s):

The remedy implemented at the Koppers Co., Inc. site in Charleston, SC is currently considered adequately protective of human health and the environment; and human health and ecological exposure pathways that could result in unacceptable risks are being controlled.

Other Comments:

None.

1.0 INTRODUCTION

The purpose of five year reviews is to determine whether the remedy at a site is or is expected to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review Reports. In addition, Five-Year Review Reports identify issues found during the review, if any, and recommendations to address them.

The Agency is preparing this Five-Year Review pursuant to CERCLA Section 121 and the National Contingency Plan. CERCLA Section 121 states: *If the President selects a remedial action that results in hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such a review it is the judgment of the President that action is appropriate at such site in accordance with Section 104 or 106, the President shall take or require such action. The President shall report to Congress a list of facilities for which such a review is required, the results of all such reviews, and any action taken as a result of such reviews.*

The Agency interpreted this requirement further in the National Contingency Plan (NCP). 40 CFR Section 300.430(f)(4)(ii) of the NCP states: *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

The Superfund Division within EPA Region 4 has conducted this Five-Year Review of the remedy implemented at the Koppers Co., Inc. (Charleston Plant) NPL site. This is the second Five-Year Review for the Koppers site. The initial Five-Year Review primarily focused on the Interim Remedial Action, and was issued on January 10, 2003. Five-Year Reviews for this site are required by statute due to the presence of creosote constituents and NAPL in groundwater underlying the site that does not allow for unlimited use and unrestricted exposure.

2.0 SITE CHRONOLOGY

The following table presents the primary milestones and relevant dates in the site chronology.

EVENT	DATE
Removal Action (Fed-Serv)	March 1985
Removal Action (Peppers/Braswell)	January 1987
Site Inspection	September 1988
Proposed to National Priorities List	February 1992
AOC with Beazer East for RI/FS	January 1993
Final on National Priorities List	December 1994
Results of RI and human health BRA to public	January 1995
Public comment period on proposed Interim Remedial Action	Jan. 20 – Feb. 21, 1995
Interim Remedial Action ROD	March 29, 1995
Supplemental groundwater and ecological investigations	March 1995 – May 1996
Interim Remedial Action UAO	May 22, 1995
On-site Interim Remedial Action construction/mobilization	June 11, 1996
Site-wide Proposed Plan released to public	March 1997
Site-wide Proposed Plan public comment period	April 3 – June 2, 1997
Interim Remedial Action construction completed	November 13, 1997
Site-wide ROD	April 29, 1998
UAO with Beazer East to implement site-wide ROD	January 25, 1999
Mobilization for soils, drainage ditch sediments and north tidal marsh component	February 1999
Mobilization for Ashley River capping component	June 2001
ESD for Ashley River remedy	August 2001
First 5-Year Review Report issued	January 10, 2003
Mobilization for south tidal marsh sediments, northwest corner S/S and NAPL/groundwater recovery systems	March 2003
ESD for barge canal and northwest corner	April 2003
Pre-Final/Final Construction Inspection	July 30, 2003
Preliminary Close Out Report approved/construction completion achieved	September 25, 2003
Full scale NAPL and groundwater recovery begins in former treatment area and old impoundment area	October 2003

3.0 BACKGROUND

Beazer East, Inc. is the new name of Koppers Company, Inc. and is thus the same corporation that operated the former wood treatment plant at the site. After discontinuing operations at the site in 1978, Beazer sold all the property it owned within the site boundaries. Beazer reacquired a majority of the site through property acquisitions in 1993 and 1998 and held that property until the third quarter of 2003 when Ashley LLC purchased the parcels previously owned by Beazer. The property transfer from Beazer to Ashley LLC was conveyed by a limited warranty deed that included among other items prohibitions on residential development and groundwater use (e.g. institutional controls).

3.1 Physical Characteristics

The site is approximately 102 acres in size and is located in the neck area of northern Charleston, SC on the west side of the peninsula formed by the Ashley and Cooper Rivers. The site contains various commercial operations and is surrounded on the north, south and east by a mixture of industrial, commercial and residential properties. From 1940 to 1978, the Koppers Company operated a wood-treatment facility on approximately 45 acres of the site that is generally bounded on the north by Milford Street, on the south by Braswell Street, on the east by the King Street Extension, and on the west by the Ashley River. The remaining 57 acres of site, located south and adjacent to the former Koppers property, were never owned by Koppers. These 57 acres were part of a larger tract of land (the entire area south of Braswell Street) owned by the Ashepoo Phosphate/Fertilizer Works. This property was used for phosphate and fertilizer production by a series of owners from the turn of the century until 1978. As discussed below in Section 3.3, EPA incorporated these 57 acres into the site boundaries to determine the environmental impact that the previous dredging operations had on the Ashley River and neighboring tidal marsh. The general site location is depicted on Figure 1.

3.2 Land & Resource Use

The site is located in what has been an industrial section of Charleston County known as the "neck area". Land use at the site subsequent to Koppers' operations consisted of a mixture of commercial and light industrial operations. Pockets of residential development exist within a ½ mile radius of the site to the north, south, and east. These neighborhoods include Silver Hill south of the site and west of I-26, Four Mile Hibernian directly east of I-26, and Rosemont north of the site and west of I-26. Rosemont is the largest of these neighborhoods, with primary access provided by Doscher Street off Hagood Avenue.

As discussed above, Ashley LLC purchased a majority of the site from Beazer East in the third quarter of 2003. The former Koppers site is now part of a 218 acre tract that Ashley has acquired and plans to redevelop as the Magnolia project. Magnolia will be a mixed-use development that will include approximately 3,000 to 4,000 residential units, 1 to 2 million square feet of commercial/retail use, over 500 hotel rooms, and 200,000 square feet of civic space. Construction on the initial phases of Magnolia is expected to begin in the Spring/Summer of 2008.

The site is very flat with topographic relief ranging from approximately 15 feet above the National Geodetic Vertical Datum (NGVD) in the eastern portion to 0 feet above NGVD near the Ashley River. Surface water drainage at the site occurs as overland flow or through many engineered conveyances. These surface water drainage ditches are commonly referred to as the Milford Street drainage ditch, the Hagood Avenue drainage ditch, the Central drainage ditch, and the Braswell Street drainage ditch. The groundwater table at the site is very shallow, and is commonly encountered about 3 to 5 feet below land surface (BLS). The site is located in the Atlantic Coastal Plain physiographic province, and is underlain by the Cooper Marl clay formation. The Cooper Marl, a regional confining unit approximately 260 feet thick, is encountered at depths on-site ranging from 50 to 67 feet BLS. Therefore, subsurface data collection was focused on the water bearing units above the Cooper Marl. Drinking water for this area is supplied by the City of Charleston via surface water intakes. Groundwater above the Cooper Marl is not used for residential or industrial supply.

3.3 History of Contamination

Wood-treatment activities primarily consisted of treating raw lumber with creosote. Pentachlorophenol (penta) and copper chromium arsenate (CCA) were also used as wood preservatives for short periods of time. The plant generally processed utility poles, foundation pilings, bridge timbers, and railroad materials (e.g. cross ties). The volume of wood treated at the site was approximately 200,000 cubic feet per month. The majority of wood-treatment operations were conducted in the eastern portion of the site, now identified as the former treatment area (FTA). In the FTA, Koppers maintained numerous above ground storage tanks for the storage of wood-preservatives. The tank farm area in the northeastern corner of the FTA contained six tanks ranging in size from 50,000 to 650,000 gallons. Koppers also maintained six above ground working tanks, four of which were on an elevated platform located east of the treatment building. When penta and CCA were in use, separate working tanks contained these preservatives. Wood preservatives were cycled from the storage tanks, to the working tanks, and finally to the treatment cylinders.

Once the virgin lumber was sized, seasoned or otherwise made ready for treatment, it was pressure treated in one of four pressure treating cylinders. One pressure vessel was dedicated to treating with penta and CCA, and the remaining three were used exclusively for creosote. The cylindrical pressure vessels were approximately 133 feet long and 8 feet in diameter with a door at one end. The wood was loaded onto tram cars and pushed into the cylinders. The cylinder was sealed, a vacuum was applied to remove the air from the cylinder and wood cells, and the wood was impregnated with the preservative. At the end of the treatment process, the excess preservative was pumped from the cylinder to the working tanks for re-use. A final vacuum was then placed on the treatment cylinder and any additional wood-preservative was drawn out of the wood. The cylinder door was opened and the trams, loaded with treated wood, were pulled from the cylinder onto the drip tracks.

The drip track area extended from the FTA in the eastern portion of the site to approximately two thirds of the way to the Ashley River and parallel to the southern Koppers property boundary. The drip tracks were elevated above the rest of the site by 5 to 6 feet. These tracks were constructed at this elevation when the facility was built to facilitate manual movement of treated wood during off loading to a vehicle for transport from the site. Treated wood was either shipped directly to the customer or stored on-site.

During the treatment process, wastewater was generated when steam was used to remove moisture from the wood and boiler system. The wastewater from the treatment process contained oils, creosote, and other solids. The wastewater was recovered in a sump pit located adjacent to the treatment cylinders and pumped to a series of six separation tanks located near the FTA just south of Braswell Street. Creosote, which has a density greater than water, would settle to the bottom of the sump pit and separation tanks. The creosote was recovered, pumped to a dehydrator to remove excess moisture, and then to the working tanks for re-use. Water from the separation tanks was discharged to the south Braswell Street drainage ditch which flowed westward to the Ashley River. On occasion, the volume of the separation tanks was not sufficient to handle all the material coming from the sump pit and creosote would overflow into the south Braswell Street drainage ditch. Historical aerial photographs and subsequent environmental data indicate that creosote constituents were transported with wastewater and surface water run-off along the south Braswell Street drainage ditch into the Old Impoundment Area (OIA). After the mid 1960's, wastewater from the separation tanks was discharged to the publicly owned treatment works (POTW).

Residues that settled to the bottom of the treatment cylinders were removed periodically when accumulations interfered with the treatment process. Most of the material removed was sand and bark which were coated with creosote. The creosote residue was transported by rail and deposited in the northwestern corner of the site. This practice was discontinued in the mid-1960's when residue materials were hauled off-site by a private waste hauler. In addition, a four acre tract of land in the northwest corner of the Ashepoo Phosphate/Fertilizer Works property (south of Braswell Street) was leased by Koppers from 1953 to 1968 for the stated purpose of depositing saw dust, bark, and other wood waste materials resulting from stripping operations.

Subsequent to Koppers' operations, the FTA was used by several entities that leased the property. The bulk creosote storage tanks in the tank farm area were used by Fed Serv in the early 1980's to store waste oil. From 1978 to 1982, Pepper Industries used the working tanks to store ship bilge and tank wastes. Braswell Shipyards operated a commercial and military ship cleaning, repair, and refurbishing business on the northwest corner of the site from 1978 until the mid-1990s. The parcel of property just south of the former Braswell Shipyards is used by Parker Marine for prefabrication of marine structures.

The 57 acre parcel south and adjacent to the Koppers property was used by a series of owners to produce phosphate based fertilizers from around the turn of the century to 1978. After obtaining a permit from the U.S. Army Corps of Engineers, Southern Dredging excavated a barge canal in November 1984 that extended approximately 1,000 feet inward from the Ashley River. Slurry material from the canal dredging was pumped 700 feet east of the barge canal and deposited in a bermed spoils area. Water was allowed to flow over a culvert into the south tidal marsh while solids settled out within the bermed spoils area. As a result of the dredging, South Carolina regulatory personnel responded to the presence of exposed creosote poles, highly turbid water and an oily sheen on the Ashley River adjacent to the barge canal. Approximately 100 dead fish were observed in the Ashley River within ¼ mile downstream of the canal. It is believed that this barge canal was dredged into the 4 acre area formerly leased by Koppers for the disposal of waste wood products resulting from their stripping operations.

3.4 Initial Response

The first area to be investigated on-site was the Pepper Industries facility which utilized the former creosote working tanks and wood treatment building. After Peppers Industries abandoned the property in November 1982, Braswell Shipyards notified the South Carolina Department of Health and Environmental Control (SCDHEC) that the tanks were leaking their contents. Sampling and analysis indicated that the tanks contained various oils, contaminated water, and oily sludges. Under an Administrative Order on Consent (AOC) issued by SCDHEC in August 1983, Pepper Industries began a cleanup operation on the creosote working tanks, but later declared bankruptcy and ceased all cleanup activities. Braswell Shipyards performed a cleanup operation of the Peppers Industries property in January 1987, during which they removed all the above ground storage tanks and containers on the property and arranged for proper disposal of the wastes. Koppers financed half the expense of this cleanup operation.

Historical investigations conducted from 1983-1985 by SCDHEC and EPA revealed numerous releases of waste oil from the above ground storage tanks in the tank farm area leased by Fed Serv Industries. Under an AOC issued by EPA in March 1985, Fed Serv, Koppers and a suite of other entities initiated emergency response actions at the former tank farm area. The removal activities generally involved proper disposal of material in the tanks, demolition of the tanks, and excavation/disposal of impacted soils. As a follow up to early removal actions at Peppers and Fed Serv, EPA initiated a Site Inspection (SI) in 1988 to gather the necessary information to prepare a Hazard Ranking System (HRS) package.

3.5 Basis for Taking Action

The Site was proposed to the NPL in February 1992 and became Final on the NPL in December 1994. In January 1993, a site-wide Remedial Investigation/Feasibility Study (RI/FS) was initiated by Beazer East under an AOC with EPA. An Interim Action ROD was issued by EPA on March 29, 1995. The Interim Action ROD was a source control effort that involved several components designed to eliminate off-site migration of non-aqueous phase liquid (NAPL) via surface water conveyances and shallow groundwater in close proximity to the former treatment area. The Interim Action work was completed in 1997 and generally involved physical reconstruction and rehabilitation of the Milford Street and Hagood Avenue drainage systems, installation of six shallow NAPL extraction wells along Milford Street and installation of two intermediate NAPL extraction wells near the former pressure vessels.

The Final Human Health Baseline Risk Assessment included in the RI Report calculated potential unacceptable carcinogenic and non-carcinogenic risks for the future industrial and current off-site resident exposure scenarios. A potential carcinogenic risk of 8×10^{-3} and a Hazard Index of 20 was calculated for the future on-site worker exposed to surface soils and sediment/surface water of the on-site drainage ditches. A potential carcinogenic risk of 3×10^{-4} and Hazard Index of 5 was calculated for the future on-site utility worker exposed to surface and subsurface soils. Chemicals of concern for the future industrial exposure scenario included PAHs, arsenic, dioxin, and pentachlorophenol. A potential carcinogenic risk of 1×10^{-1} was calculated for the current off-site resident. Non-cancer Hazard Indices for the adult and child off-site resident were 10 and 10,000 respectively. The high risks for the current off-site resident exposure scenario were primarily driven by dermal contact exposure with surface water of the

Hagood Avenue drainage ditch. Chemicals of concern in the surface water under this exposure scenario were PAHs, arsenic and dioxin. The Interim Action ROD discussed above was issued by EPA to address these potential human health risks in the short-term while a final, site-wide remedy was developed.

An ecological risk assessment was also conducted to evaluate potential risks posed to ecological receptors. The ecological risk assessment was a multiple lines of evidence approach that included sediment chemistry, acute/chronic toxicity testing, and benthic macroinvertebrate/food chain evaluations. The results of this effort were utilized to define Areas of Potential Ecological Concern (APECs) as sediments requiring potential remediation or further investigation. Sediments within APECs that demonstrated significant acute toxicity to *Neanthes arenaceodentata* and *Mysidopsis bahia* were slated for active remediation. Significant acute toxicity to the selected test species was noted in the Ashley River near the barge canal confluence, and the headwaters of the north/south tidal marshes. It's important to note that the ecological risk assessment for this site was completed before the June 1997 EPA guidance document titled, "*Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessment*" was finalized.

4.0 REMEDIAL ACTIONS

4.1 Remedy Selection

The Final site-wide remedy was issued by EPA in the ROD dated April 29, 1998. The Final ROD specified a multi-media response action to address surface/subsurface soils, sediments of drainage ditches, groundwater and NAPL, surface water contaminant transport pathways, and sediments of the Ashley River, barge canal, and north/south/northwest tidal marshes. Two Explanation of Significant Differences (ESDs) were issued to the April 1998 ROD. An ESD was issued in August 2001 that changed the Ashley River remedy from enhanced sedimentation to placement of an engineered, subaqueous cap. In April 2003, an ESD was issued for the barge canal and northwest corner of the site. This ESD changed the barge canal remedy from placement of an engineered subaqueous cap, to natural deposition and monitored natural recovery; and changed the groundwater/NAPL component for the Northwest Corner of the site from active NAPL recovery with extraction wells, to immobilization using stabilization and solidification techniques.

4.2 Remedy Implementation

Beazer implemented the selected remedy through an Unilateral Administrative Order (UAO, effective date of January 25, 1999) with EPA, and pursuant to the January 1999 Remedial Design Work Plan. Design and construction efforts were separated into the following seven distinct packages:

- Site Soil and Drainage Ditch Sediments;
- North Tidal Marsh Sediments;
- In-Situ Bioremediation of Northwest & South Tidal Marsh Sediments;
- Barge Canal Sediments;
- Ashley River Sediments;

- South Tidal Marsh Sediments; and
- NAPL/Groundwater.

Initial priority was given to those remedy components that would generate F032, F034, and/or F035 listed wastes and would require off-site disposal prior to the Land Disposal Restriction (LDR) deadline of May 12, 1999. The north tidal marsh sediments and the majority of the site soils were protectively managed with these waste listings.

The various remedy components were implemented and constructed via three primary mobilization efforts conducted in February 1999 for site soils and drainage ditch sediments, June 2001 for the Ashley River sediments; and March 2003 for the south tidal marsh sediments and NAPL/groundwater. The remainder of this section provides a brief description of the construction activities associated with the above described remedy components. The reader is referred to the Remedial Action Report (URS Corp., August 2003) for a more detailed account of this subject matter.

4.2.1 Site Soil and Drainage Ditch Sediments

The ROD specified soil and drainage ditch sediment excavation levels that were adequately protective for the future on-site worker (surface soil) and future utility worker (subsurface soil) under a future industrial land-use scenario. Surface soil was defined as observed ground surface to six inches below ground surface. Subsurface soil was defined as six inches below ground surface to the observed water table. The soil and drainage ditch sediment excavation levels are summarized in the table below:

Koppers Site Soil & Sediment Excavation Levels

Constituent	Surface Soil Excavation Limits (mg/kg)	Subsurface Soil Excavation Limits (mg/kg)
Arsenic	135	1,550
B(a)P-TE[1]	20	275
Dioxin TEQ[2]	0.0015	0.02
Pentachlorophenol	235	4,300

Notes:
[1] – B(a)P-TE (Benzo(a)pyrene Toxicity Equivalent) is a summary parameter which converts concentrations of carcinogenic PAHs to an equivalent Benzo(a)pyrene concentration.
[2] – Dioxin Toxicity Equivalent Quotient (TEQ) is a summary parameter which convents concentrations of dioxin congeners to an equivalent 2,3,7,8-TCDD.

In May 1998, pre-design delineation was performed to determine the volume and extent of soils exceeding the soil remediation goals above. The site was divided into Remedial Action Zones (RAZs) based on historical land use, physical and chemical characteristics, and proposed remediation activities. Results from the pre-design delineation were incorporated into historical site sampling data and examined by geostatistical analyses to compute the most accurate delineation of the excavation and capping areas within the various RAZs. Based on the results of the geostatistical analyses, the ROD soil remedial action boundaries were defined and approved by EPA and SCDHEC prior to field mobilization.

An estimated 22,000 tons of material was excavated and hauled to an on-site materials handling and staging area before being transported off-site to a Subtitle C landfill in Pinewood, SC for final disposal. This volume estimate also included sediments excavated from the north tidal marsh (see Section 4.2.2 below). Post excavation confirmatory sampling was conducted to verify that all RAZs met the specified performance standards.

An estimated 3,600 linear feet of drainage ditches were also reconstructed to eliminate an important contaminant transport pathway. The Braswell Street drainage system was reconstructed as a closed drainage system consisting of large diameter high-density polyethylene (HDPE) pipes and HDPE lined inlets and manholes. HDPE material was selected as the construction material because joints (pipe to pipe and pipe to inlet) could be welded to ensure a watertight seal. Existing drainage ditches were abandoned. Shallower swales were constructed to direct runoff to the inlets of the newly installed drainage system. The Milford Street drainage system was reconstructed along the existing drainage easement as an open ditch system consisting of a shallow lined ditch. The ditch lining consisted of a welded HDPE liner that was overlain by an 8inch thick concrete grout mat. Additionally, the Central Drainage Ditch was reconstructed in the previous drainage ditch alignment as an open ditch system consisting of a shallow lined ditch similar to the revised Milford Street drainage system.

Approximately 40 total acres of the site were covered with a protective engineered soil cover (ESC). An estimated 30 acres of the ESC were required to comply with the ROD, and the remaining area was capped voluntarily by Beazer to better integrate the final cap dimensions with existing land use and property boundaries. Four types of ESCs were constructed and all were underlain by a geotextile barrier for visible demarcation purposes.

- Type IIA - ESC consisting of a 12-inch vegetated compacted fill;
- Type IIB - ESC consisting of eight inches of compacted fill, followed by four inches of vegetated topsoil;
- Type IIC - ESC consisting of a 12-inch aggregate base course; and
- Type IID - ESC consisting of a three-inch aggregate base course layer overlain by a two-inch asphalt pavement.

In December 2001, a potential release of creosote related material at the outfall of the Braswell Street drainage system near the Barge Canal was observed. Corrective measures were implemented from July 8 through July 23, 2002. The repair consisted of the installation of a cement-bentonite seepage cutoff wall across the two pipes approximately 190 feet upstream from the outfall headwall and immediately behind the headwall, injecting the gravel pipe bedding with a cement-bentonite grout mixture, and removing and solidifying the impacted sediments within the rip-rap apron downstream of the outfall. The solidified sediments were later transported to Canada for landfill disposal as a listed hazardous waste.

4.2.2 North Tidal Marsh Sediments

The ROD required excavation, capping/revegetation, and off-site disposal of sediments from the north tidal marsh that demonstrated significant acute toxicity to selected indicator species (*Neanthes arenaceodentata* and *Mysidopsis bahia*). An estimated 1,300 linear foot reach of the tidal creek channel extending northwest from the intersection of Hagood Avenue

and Doscher Street was remediated. The vertical limits of excavation were established as the biologically active zone, or the upper 12 inches of material. The horizontal limits of excavation were dictated by field conditions and angle of repose for the material, but generally ranged from 20 to 30 feet in width. Best professional efforts were employed to remove visually impacted material beyond the established vertical/horizontal excavation limits, where practical.

Construction activities were initiated with dewatering and drainage control of the work area. The Hagood Avenue drainage system was temporarily diverted around the work area via a diversion ditch installed along the north side of Hagood Avenue. Ashley River tidal fluctuations were controlled by the installation of a tidal embankment across the marsh at the most downstream edge of the work area. The tidal embankment was fitted with an outlet structure to bypass water that accumulated in the work area. The original Hagood Avenue drainage system was restored and the tidal embankment was removed following construction.

In addition to the tidal embankment, two access roads were constructed off Hagood Avenue to provide access to the remediation area. Access to the excavation area was accomplished through the use of a wooden-mat working platform. The mat platform was constructed along the centerline of the tidal creek channel and the excavation proceeded in an upstream to downstream direction to minimize the possibility of re-contamination. As discussed previously, implementation of north tidal marsh remedy was coordinated with the upland soils component due to the impacts of the Phase 4 Land Disposal Restrictions on off-site disposal logistics. An estimated 1,500 cubic yards of material was removed from the north tidal marsh, hauled to the on-site material handling and staging area, and blended with upland soils before being transported off-site to a Subtitle C landfill in Pinewood, SC for final disposal.

Engineering controls were employed during active excavation activities to provide short-term protectiveness and to mitigate the potential release of constituents via suspended sediments, tidal fluctuations and stormwater discharges. As an additional sediment and erosion control measure, hay bales were strategically placed to remove sediment from any bleed water or stormwater runoff prior to discharge at the downstream end. The hay bales were maintained during construction and restoration to assist in stabilizing the backfill and aid in revegetation of the area.

Once the excavations were completed to the required depth, a protective cap consisting of a nonwoven geotextile and a minimum 12 inches of sand was placed over the disturbed areas. The disturbed areas were returned to approximate pre-excavation elevations to avoid disruption of the natural dynamics of the local tidal marsh ecosystem and revegetated and restored with native species typical to tidal marshes of the vicinity. A monitoring and contingency plan was adopted to ensure the restored areas returned to functioning and productive habitat.

4.2.3 In-Situ Bioremediation of Northwest & South Tidal Marsh Sediments

The ROD specified in-situ bioremediation for the northwest marsh and portions of the south tidal marsh that did not demonstrate significant acute toxicity to the selected indicator species (e.g. *Neanthes arenaceodentata and Mysidopsis bahia*). The ROD recognized that in

situ bioremediation was an emerging/innovative technology and established a modest Performance Standard for this particular remedy component as reduction of sediment constituent concentrations from observed baseline conditions.

Following the completion of additional characterization work in the south tidal marsh to refine the excavation boundaries, a 12 month pilot-test for in situ bioremediation of sediments in portions of the northwest and north tidal marshes was conducted from April 2000 to April 2001. The pilot study focused on the following three topics:

- Monitoring acute toxicity;
- Monitoring microbial community activity and constituent concentration of sediments in response to nutrient enhancement; and
- Monitoring marsh biology (e.g. plants and macroinvertebrates) in response to nutrient enhancement.

The pilot study included controlled nutriation (e.g. fertilization with nitrogen and phosphorus) over the entire south marsh study area and the addition of oxygen releasing compounds (ORCs) to three smaller sub plots. The goal of these treatments was to enhance phytoremediation and to stimulate the catabolic activities of the indigenous microflora with known abilities to biodegrade organic constituents, namely poly aromatic hydrocarbons (PAHs). The accelerated biological activities were intended to reduce constituent concentrations to acceptable levels as measured by a reduction in acute toxicity. The pilot study indicated that in situ bioremediation did not produce an appreciable reduction in contaminant concentrations or a reduction in acute toxicity. As a result, future full-scale implementation was not pursued.

4.2.4 Barge Canal Sediments

The remedy selected in the ROD for the approximate 3.2 acre barge canal was placement of an engineered, subaqueous cap. However, several lines of evidence collected during the Remedial Design phase of the project determined that the Barge Canal is dominated by sediment depositional dynamics. Available data indicate that continued natural deposition of sediments in the Barge Canal will achieve the objectives established in the ROD for the subaqueous cap alternative. EPA prepared an ESD in April 2003 to present the rationale supporting the revised remedy for the Barge Canal. A monitoring and contingency plan was adopted to ensure the revised natural deposition remedy meets the Performance Standards established in the ROD. In general, this effort consisted of two sampling events to verify that concentrations of PAHs in sediments of the Barge Canal have decreased over time. Monitoring results to support the monitored natural recovery (MNR) for the barge canal are discussed further in Section 6.0 (Five-Year Review Process).

4.2.5 Ashley River Sediments

The ROD selected enhanced sedimentation for a strip of near shore sediments of the Ashley River that extended approximately 1,500 linear feet north/south along the site and approximately 50 to 100 feet west of the shoreline towards the former navigation channel. The conceptual approach to enhanced sedimentation involved capping impacted river sediments by increasing

and accelerating natural sedimentation processes. Enhanced sedimentation was to be achieved by decreasing water velocities in the area of interest, resulting in increased deposition of the river's suspended sediment load. The ROD required modeling studies be conducted to determine the engineering structures to be utilized to optimize sediment deposition and predict sediment deposition rates within the area of interest.

During the Remedial Design phase, numerical sediment transport modeling was conducted to support identification and evaluation of enhanced sedimentation alternatives. The results of this modeling effort indicated that the established Performance Standards for the Ashley River sediments could best be achieved by the installation of a sheet pile barrier wall system around the area slated for remediation. However, geotechnical analysis for the structural design of the sheet-pile wall determined that installation would be technically challenging and cost prohibitive due to the steep slopes of the Ashley River channel and depth of soft sediments. Moreover, concerns related to existing derelict dock structures and operational issues of property owners along the Ashley River necessitated a change in the selected remedy for Ashley River sediments. Therefore, EPA issued an ESD in August 2001 that revised the Ashley River remedy to placement of an engineered, subaqueous cap with a minimum thickness of 12 inches over the area of interest.

Construction activities for the Ashley River component began in June/July 2001 with the demolition of the old railroad trestle and pier structures, cutting and removal of the associated timber piles, construction of access roads and construction of a revised central drainage ditch outfall. The cap construction followed the demolition activities and was completed in December 2001. The total area of the Ashley River capped was approximately 132,000 square feet, or roughly 3 acres. The subaqueous cap consisted of two different types of caps, each having a 12inch minimum thickness, that consisted of the following:

- An approximate 2 acre sand cap that was underlain by a non-woven geotextile to minimize consolidation concerns. Settlement and thickness monitors were placed in the sand cap in a regular grid at 50 foot centers to measure cap integrity over time.
- The remaining area immediately in front of the central drainage ditch outfall and the Parker Marine barge landing area received a cement-stabilized cap due to erosional concerns. This was accomplished by using a tubular mixing device and amphibious excavator to inject and mix cement based grout into the upper 2 feet of sediments. Approximately 2,450 cubic yards of sediment were solidified to a depth of 2 feet using this technique.

A monitoring program was developed to measure the cap's effectiveness over time in mitigating potential risks to the benthic community and upper trophic level receptors. The results of this monitoring program are discussed further in Section VI below.

4.2.6 South Tidal Marsh Sediments

Similar to the north tidal marsh, the ROD required the excavation, capping/revegetation, and off-site disposal of sediments from the south tidal marsh that demonstrated significant acute toxicity to selected indicator species (e.g. *neanthes arenaceodentata and mysidopsis bahia*). The area of the south tidal marsh slated for removal in the ROD was approximately 1.5 acres.

Additional refinement sampling conducted during the Remedial Design phase of the project modified the horizontal excavation footprint to approximately 2 acres. Vertical limits of excavation were established as the biologically active zone, or the upper 1 foot of material.

South tidal marsh construction activities began with mobilization in March 2003 and were finished with revegetation efforts by June 2003. The construction activities and sequencing for this component were performed in a very similar fashion to that of the north marsh construction activities. A tide control embankment was installed around the periphery of the work area and a barrel/riser outlet structure was installed to bypass water that accumulated in the excavation area. Sediments from the south tidal marsh were removed by tracked excavators working on marsh mats and/or from the tide control embankment. Excavated material was hauled to an on-site handling and staging area for stabilization with cement kiln dust (CKD), before being hauled off-site to the Lee County Subtitle D landfill in Bishopville, SC for final disposal. Approximately 2,500 tons of material, which included an estimated 600 tons of CKD, was hauled off-site for proper disposal.

The excavated area was backfilled with a non-woven geotextile and a minimum 12 inches of sand that was graded to match pre-excavation tidal marsh elevations. The south tidal marsh was revegetated and restored with native species typical to tidal marshes of the area. A monitoring and contingency plan was adopted to ensure the restored areas returned to functioning and productive habitat.

4.2.7 NAPL/Groundwater

The ROD identified three source areas of subsurface NAPL on site that were referred to as the former treatment area, the old impoundment area and the northwest corner. Consistent with EPA's policy for sites with NAPL impacts in groundwater, the established Performance Standards for these three source areas were:

- Removal or treatment of NAPL to the maximum extent practicable;
- Containment of potentially non-restorable NAPL source areas; and
- Containment and restoration of aqueous contaminant plumes.

The ROD indicated that the above Performance Standards would be achieved by the recovery of NAPL and impacted groundwater by extraction wells installed in the shallow and intermediate water-bearing units underlying the source areas. However, additional data collected from the northwest corner during the Remedial Design phase indicated that although NAPL was present, it did not appear to be of sufficient quantity and/or mobility to permit recovery via extraction wells. Subsequent treatability testing demonstrated that NAPL in the northwest corner could be immobilized by in-situ stabilization and solidification (S/S) with Portland Cement. Therefore, EPA issued an ESD in April 2003 to revise the groundwater/NAPL strategy at the northwest corner to S/S. The groundwater and NAPL remediation strategy for the former treatment area and old impoundment area remained extraction via recovery wells.

Mobilization for the northwest corner S/S remedial component was initiated in May 2003 and construction was completed by July 2003. The northwest corner S/S work and south tidal marsh work described above were essentially conducted concurrently. The horizontal extent of the S/S area was approximately 17,500 square feet and the vertical extent was one-foot into the clay-confining unit, which varied in depth across the treatment area, but averaged approximately 14 feet. The S/S remedy was implemented using a slurry trenching technique due to the close proximity to the Ashley River and shallow depths to the observed groundwater table. The treatment area was divided into 33 trenches, each being 4.5 feet wide and varying in length and depth. Each adjacent trench overlapped neighboring trenches to ensure complete treatment of the specified area.

Impacted material was excavated from each treatment trench, under bentonite slurry, and was transported to the mix containers for subsequent treatment. Approximately 170 tons of oversize debris (rail ties, steel, poles) encountered during the excavation was separated from the excavated material, and either appropriately sized for placement back into the stabilized material, or managed at an offsite landfill. Due to the bulking observed during treatment, a portion (approximately 4,800 tons) of the excavated material was stockpiled and subsequently transported offsite for disposal at a non-hazardous landfill. In addition, portions of three treatment trenches were re-solidified/stabilized because quality assurance (QA) testing suggested that the resulting mixture did not achieve the required permeability specification ($1x10^{-5}$ cm/sec). Subsequent testing supported that the re-solidified/stabilized material met or exceeded the required permeability specification. A total of 13,199 tons of impacted material, including the re-solidified/stabilized soils, were excavated and treated as part of this remedy.

A 9 percent Portland Cement mix design was initially used for treatment of the impacted material, consistent with the mix design selected following treatability testing. However, QA testing, specifically unconfined compressive strength (UCS) and permeability, suggested the need to modify the mix design during full-scale implementation. On June 11, 2003, the mix design was modified to include 11 percent Portland Cement by wet weight of soil. On June 25, 2003, 1 percent dry bentonite powder by wet weight of soil was added to the 11 percent Portland Cement mix design. For the remainder of the solidification/stabilization activities, the 11 percent Portland Cement and 1 percent powdered bentonite mix design was used.

Following treatment, the solidified/stabilized material was placed back into the open excavation similar to the construction of a slurry wall. At the completion of the solidification/stabilization activities, the surface of the solidified/stabilized soil was graded to promote drainage, and clean aggregate was placed consistent with the Site Soil and Drainage Ditch Sediments RA for this area.

NAPL recovery system installation activities were initiated in June 2003 and continued through August 2003. A total of thirteen new recovery wells were installed in the former treatment area and old impoundment area. NAPL recovery wells in the former treatment area were piped to the existing Interim Action treatment system for subsequent discharge to the City of North Charleston Publicly Owned Treatment Works (POTW). The NAPL recovery wells in the old impoundment area were piped directly to the POTW sewer located on Braswell Street. The full scale recovery system was integrated with relevant components of the Interim Action treatment system, and full scale recovery operations began in October 2003.

A performance monitoring program for the groundwater/NAPL recovery and S/S remedies was developed using a network of existing and new monitoring wells across this site. A monitoring plan was adopted to ensure the long-term permanence and effectiveness of the NAPL recovery systems, the solidification/stabilization remedy, and monitored natural attenuation mechanisms to meet the required Performance Standards. Quarterly operation and maintenance reports have been submitted to EPA and SCDHEC since this recovery system began full scale operation. Results from the monitoring program and quarterly O&M reports are discussed further in Section 6.4.2 below.

4.3 Remedy Costs/Systems O&M

Based on cost information provided in the Final Feasibility Study (ENSR, December 1996), the net present worth of the ROD specified remedy was estimated at $11.975 Million. In general, this total remedy cost included $6.082M for soil/drainage ditch sediments; $3.074M for groundwater/NAPL collection systems and operation/maintenance; $541,000 for enhanced sedimentation in the Ashley River; $447,000 for subaqueous capping in the Barge Canal; $1.682M for excavation and restoration of the North/South Tidal Marshes; and $149,000 for in-situ bioremediation

Based on actual remedial construction expenditures; and estimated operation, maintenance and monitoring costs, the net present worth of the remedy implemented at the Site is approximately $20.4 Million. In general, this total remedy cost included $9.3M for soil/drainage ditch sediments; $5.53M for groundwater/NAPL collection systems and solidification including operation and maintenance (O&M); $2.82M for engineered cover in the Ashley River; $100,000 for the Barge Canal natural sedimentation remedy; $2.3M for excavation and restoration of the North/South Tidal Marshes; and $350,000 for in-situ bioremediation.

The original cost estimate in the ROD for O&M of the groundwater/NAPL recovery and treatment systems was $1,400,000. This was a 30-year, Net Present Value estimate from the 1996 FS Report. Actual annual costs for O&M were reported to be approximately $330,000 for calendar year 2005; $300,000 for calendar year 2006 and $250,000 for calendar year 2007. The O&M cost estimate in the 1996 FS Report appears to have grossly underestimated the annual O&M costs associated with the groundwater/NAPL recovery and treatment systems at this site.

5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

The first Five-Year Review issued in January 2003 focused primarily on the Interim Remedial Action. The Protectiveness Statement from the 2003 Five Year Review stated "*The Interim Remedial Action at the Koppers-Charleston, SC plant is adequately protective of human health and the environment in the short-term as potential surface water and sediment exposure pathways have been eliminated. The remaining remedy components of the site-wide April 1998 ROD shall be constructed, and all remedy components shall be properly operated and maintained to ensure adequate long-term protection.*" The 2003 Five Year Review included the following recommendation which has been implemented; "*Operation, maintenance and*

monitoring efforts associated with the Interim Remedial Action should be integrated fully into the full-scale groundwater/NAPL remedy. Construction activity for the groundwater/NAPL remedy component is expected to begin in Spring 2003."

This second Five-Year Review is actually the first evaluation of remedy protectiveness conducted after construction was completed on the site-wide remedy in September 2003. Therefore, activities completed since January 2003 generally involved construction of the remaining remedy components, operation and maintenance of the NAPL/groundwater recovery system, and routine monitoring activities specified by the Comprehensive Environmental Monitoring Plan (Malcolm Pirnie, April 2004).

The Comprehensive Environmental Monitoring Plan (CEMP) specified monitoring requirements for all remedy components except the NAPL/groundwater recovery system. The monitoring well network, sample frequency, and analytical parameters for the evaluation of the NAPL/groundwater recovery system were specified in the associated Final Remedial Design Report. Monitoring requirements by remedy component are summarized below:

- Soil & Drainage Ditch Sediments: Annual inspections of the ESC and drainage ditch lining system for integrity and physical condition.

- North Tidal Marsh Sediments: Vegetation was re-established in the remediation area per Critical Area Permit with SCDHEC's Ocean & Coastal Resource Management (OCRM) by February 2001. No additional monitoring required.

- In-Situ Bioremediation of Northwest & South Tidal Marsh Sediments: Full-scale application was not pursued. Monitoring considered complete.

- Barge Canal Sediments: Initial monitoring event was conducted in April 2003 to support the rationale of the ESD which changed the remedy from an engineered cap to MNR. This monitoring event was repeated in 2004 and 2007, and the results are discussed further in Section 6.4.3 below.

- Ashley River Sediments: The baseline survey was conducted in December 2001 to complete the as-built drawings for the completed sand cap. Monitoring for cap thickness has been conducted annually since 2003.

- South Tidal Marsh Sediments: The work for this component was completed in June 2003. Semi-annual monitoring events for vegetative success were conducted in accordance with a Critical Area Permit from SCDHEC OCRM. Vegetation comparable to the reference marsh was re-established in the south marsh by December 2006, and no additional monitoring is required.

6.0 FIVE-YEAR REVIEW PROCESS

The five-year review process conducted for this site included a review of technical documents, review of quarterly O&M reports related to the NAPL/groundwater recovery system, technical meetings with key project personnel, and a formal site inspection.

6.1 Administrative Components

An internal scoping meeting was held between appropriate EPA Region 4 personnel and management on August 29, 2007. During this meeting, the Five Year Review team was identified, and the schedule for completion was discussed. Other stakeholders such as SCDHEC, Beazer East, and Magnolia Development were also notified of the general process, and anticipated schedule for completion.

6.2 Community Notification & Involvement

Community notification of the five-year review was provided in the Charleston Post & Courier on March 21, 2008. A copy of the notification is provided in Appendix C. The EPA Remedial Project Manager and Community Involvement Coordinator did not receive any calls or comments from the community related to the Five-Year Review process. Comprehensive community involvement and outreach activities were conducted during the initial planning phases of the Magnolia development, which includes the Koppers site. Therefore, no formal interviews were conducted with local residents or community officials during this five-year review. A copy of this Five Year Review Report will be placed in the local information repository once it is approved by the EPA Region 4 Superfund Division Director.

6.3 Document Review

The following documents were reviewed as part of the development of this Five-Year Review report:

- Preliminary Close Out Report Koppers Co., Inc. Charleston, SC (US EPA Region 4, September 25, 2003)

- Comprehensive Environmental Monitoring Plan, Former Koppers Co., Inc. Site, Charleston, SC (Malcolm Pirnie, April 2004)

- First Quarter 2004 Operations & Monitoring Report, The Former Koppers Co., Inc. Superfund Site, Charleston, SC (Key Environmental, April 2004);

- Second Quarter 2004 Operations & Monitoring Report, The Former Koppers Co., Inc. Superfund Site, Charleston, SC (Key Environmental, August 2004);

- Third Quarter 2004 Operations & Monitoring Report, The Former Koppers Co., Inc. Superfund Site, Charleston, SC (Key Environmental, November 2004);

- Fourth Quarter 2004 Operations & Monitoring Report, The Former Koppers Co., Inc. Superfund Site, Charleston, SC (Key Environmental, January 2005);

- First Quarter 2005 Operations & Monitoring Report, The Former Koppers Co., Inc. Superfund Site, Charleston, SC (Key Environmental, May 2005);

- Second Quarter 2005 Operations & Monitoring Report, The Former Koppers Co., Inc. Superfund Site, Charleston, SC (Key Environmental, August 2005);

- Third Quarter 2005 Operations & Monitoring Report, The Former Koppers Co., Inc. Superfund Site, Charleston, SC (Key Environmental, October 2005);

- Fourth Quarter 2005 Operations & Monitoring Report, The Former Koppers Co., Inc. Superfund Site, Charleston, SC (Key Environmental, January 2006);

- First Quarter 2006 Operations & Monitoring Report, The Former Koppers Co., Inc. Superfund Site, Charleston, SC (Key Environmental, April 2006);

- Second Quarter 2006 Operations & Monitoring Report, The Former Koppers Co., Inc. Superfund Site, Charleston, SC (Key Environmental, July 2006);

- Third Quarter 2006 Operations & Monitoring Report, The Former Koppers Co., Inc. Superfund Site, Charleston, SC (Field & Technical Services LLC, October 2006);

- Fourth Quarter 2006 Operations & Monitoring Report, The Former Koppers Co., Inc. Superfund Site, Charleston, SC (Field & Technical Services LLC, March 2007);

- First Quarter 2007 Operations & Monitoring Report, The Former Koppers Co., Inc. Superfund Site, Charleston, SC (Field & Technical Services LLC, April 2007);

- Second Quarter 2007 Operations & Monitoring Report, The Former Koppers Co., Inc. Superfund Site, Charleston, SC (Field & Technical Services LLC, September 2007);

- Performance Evaluation Report, NAPL and Groundwater Remedy, Former Koppers Co., Inc. Superfund Site, Charleston, SC (Key Environmental, January 2006)

- Responses to Comments, GW/DNAPL Performance Evaluation Report, Former Koppers Co., Inc. Superfund Site, Charleston, SC (Beazer East, June 29, 2006)

- Response to Comments, Former Koppers Co., Inc. Superfund Site, Charleston, SC (Beazer East, March 20, 2007)

- Meeting Summary and Responses to Comments/Correspondence on the Performance Evaluation Report, Former Koppers Co., Inc. Superfund Site, Charleston, SC (September 4, 2007)

- Final 2007 Barge Canal Sediment Sampling Plan, Former Koppers Co., Inc. Wood Treating Site, Charleston, SC (AMEC, September 2007)

- 2007 Barge Canal Sediment Sampling Report (AMEC, December 2007)

- Subaqueous Cap Repair Plan, Former Koppers Site Ashley River Sediment Remedy (ERM, December 2007)

- Documentation of January 2008 Subaqueous Cap Repair Activities, Koppers Co., Inc. NPL Site, Charleston, SC (ERM, February 8, 2008)

6.4 Data Review

6.4.1 Review of Institutional Controls

In the third quarter of 2003, Ashley LLC purchased the parcels of the site owned by Beazer. The property transfer from Beazer to Ashley LLC was conveyed by a limited warranty deed that included among other items prohibitions on residential development and groundwater use (e.g. institutional controls). This limited warranty deed is attached as Appendix G. These institutional controls have been properly executed and recorded with the Charleston County Register of Mesne Conveyance.

Ashley LLC plans to redevelop this site, and other adjacent properties as Magnolia. Magnolia will be a mixed-use development that will include approximately 3,000 to 4,000 residential units, 1 to 2 million square feet of commercial/retail use, over 500 hotel rooms, and 200,000 square feet of civic space. Construction on the first phases of Magnolia, including a new bridge that will provide principle ingress/egress to Magnolia, is scheduled to begin in Spring/Summer 2008. EPA continues to work closely with the Magnolia project team to ensure that the development activities are properly integrated with the site remedy. Modifications to the existing institutional controls may be warranted at some point in the future.

6.4.2 Review of the NAPL/Groundwater Recovery System

Active NAPL recovery is occurring in the former treatment area (FTA) and old impoundment area (OIA) using a network of NAPL and groundwater extraction wells screened within the shallow and intermediate water bearing zones. The NAPL recovery system in the FTA consists of eleven shallow wells and four intermediate wells. In the OIA, the NAPL

recovery system consists of three shallow wells, and one intermediate well. This is a dual phase recovery system that extracts groundwater and NAPL through separate lines. NAPL recovery is accomplished by pumping groundwater at a controlled rate to enhance mobilization of NAPL to the extraction well sumps. The accumulation of NAPL in the storage sumps at the bottom of each extraction well is monitored on a weekly basis. When the volume of NAPL in the storage sump approaches capacity, the NAPL is extracted from the well using a surface mounted air diaphragm pump. Recovered NAPL is periodically shipped to Giant Cement Company in Harleyville, SC for use as an energy recovery fuel in rotary cement kilns.

Average groundwater recovery rates for the individual extraction wells in the FTA have ranged from 0.14 gallons per minute (gpm) to 1.0 gpm, while average groundwater recovery rates for the extraction wells in the OIA have ranged from 0.07 gpm to 0.22 gpm. Recovered groundwater is discharged to the North Charleston POTW. Groundwater extraction wells have operated continuously, except when shut down for short periods of time for maintenance and during system performance evaluations. The extraction wells in the FTA were shut down between November 2005 and May 2006 due to an access dispute on the 1 acre parcel of unimproved property where the bulk of the treatment equipment is located. NAPL recovery efficiencies (e.g. total NAPL collected/total groundwater collected) have ranged from 0.0 % to 0.46% in the FTA, and from 0.0% to 2.19% in the OIA. The target NAPL recovery efficiency for the system was 0.1% to 1.0%. Beazer reports that the Charleston recovery system is among the top three most efficient systems out of approximately 20 that they operate in the United States. To date, an estimated 8,100 gallons and 6,200 gallons of NAPL have been recovered from the FTA and OIA, respectively. The NAPL source areas for the shallow water bearing zone and intermediate water bearing zone are illustrated on Figures 2 and 3, respectively.

The Final Remedial Design for the NAPL/groundwater recovery system included a requirement to submit a Performance Evaluation Report after two years of full scale operation of the system. The Performance Evaluation Report was based on two years of quarterly operation and monitoring reports and was submitted in January 2006. While over a decade of groundwater monitoring data indicate the NAPL source plumes are stable, the Performance Evaluation Report afforded an opportunity to optimize the recovery and monitoring strategies of the system. EPA, SCDHEC, and Beazer resolved all outstanding issues via several iterations of response to written comments, and project management meetings on March 2, 2006; July 9, 2007; and November 11, 2007. Correspondence related to the optimization of the monitoring program and NAPL/groundwater recovery system is included in Appendix F. A summary of these issues is provided below:

- It appears that operation of the shallow NAPL recovery system in the OIA may be contributing to observed increases in constituent concentrations in MW-102A located adjacent to the barge canal. Additional soil borings, piezometers, and groundwater samples were collected in December 2007 to further characterize the subsurface conditions in the OIA. Beazer will submit a summary report regarding the findings of this additional investigation, and any recommendations for additional remedial activities.

- Additional investigation work will be conducted in the FTA to refine the delineation of NAPL source areas, and aqueous contaminant plumes in the vicinity of MW-12S and MW-100B.

- Additional NAPL recovery will be explored in the FTA by conducting passive NAPL recovery at MW-114, MW-107, MW-12S and MW-108. Passive NAPL recovery will be conducted for one year by bailing product when two feet or more of NAPL is measured in the above wells. Following this one year evaluation period, recommendations will be made to EPA and SCDHEC regarding future passive and/or active NAPL recovery at these locations.

- Extraction Well 3I (EW-3I) in the FTA has not recovered any NAPL since full scale system start-up. The groundwater extraction rate at EW-3I will be scaled back for 3 months. If this measure fails to increase NAPL production, the well will be pulse-pumped (e.g. turned on and off) to monitor efficiency. If improved recovery is not observed within one year, additional recommendations will be made to EPA and SCDHEC regarding discontinuing NAPL recovery efforts from this extraction well.

- Numerous modifications have been adopted for the sampling and analysis requirements. Seven existing monitoring wells will be added to the source area and aqueous phase plume monitoring locations for a one year evaluation period. Analyses will be semiannual for BTEX and PAHs, and annually for parameters related to the monitored natural attenuation evaluation. Samples of NAPL from the FTA and OIA will be also collected and tested for physical properties including interfacial tension, contact angle, viscosity, and specific gravity. This information will be used to recalculate the critical hydraulic gradient so NAPL capture zones can be verified.

- Numerous modifications were also made to the operation and maintenance reporting requirements to enhance the data evaluation. Semi-annual status reports (instead of quarterly) will continue to be submitted. A comprehensive report regarding groundwater monitoring and graphical data presentation will be submitted annually.

Regarding the northwest corner, NAPL has not been observed in any of the four monitoring wells adjacent to the S/S area. Analytical results from the monitoring wells indicate the dissolved-phase constituents have steadily decreased over time. Overall, the observations over the monitoring period suggest that the S/S remedy in the northwest corner is meeting the performance standards set forth in the ROD.

6.4.3 Review of the Barge Canal MNR Remedy

Subsequent to the April 2003 ESD that changed the barge canal remedy from subaqueous capping to MNR, two additional sampling events were conducted in 2004 and 2007. The scope of these sampling events focused on sediment quality, and salt marsh vegetation encroachment. Sediment quality was evaluated by collecting a total of ten surface samples (e.g. 0-6 inches) from 5 transects positioned east to west along the profile of the barge canal. Each

sediment sample was a 5-point composite collected within a 1.5 meter radius. Each transect was comprised of two sediment samples, one positioned north of the tidal creek, and the other positioned south of the tidal creek. Salt marsh vegetation encroachment was evaluated by comparing aerial photography from several different years.

Comprehensive results from the barge canal sediment sampling and vegetation encroachment are provided in Appendix E. An abbreviated summary of the barge canal sediment sampling data are presented in the table below:

Transect	1994 RI Data Mean Total PAHs (mg/kg) [1]	2003 Data Mean Total PAHs (mg/kg) [2]	2004 Data Mean Total PAHs (mg/kg) [2]	2007 Data Mean Total PAHs (mg/kg) [2]
1	362.0	12.8	5.3	2.1
2	166.0	12.2	5.1	3.2
3	52.0	17.7	9.1	5.2
4	81.0	12.7	6.1	1.7
5	31.0	77.5	7.4	1.3
Sample Event Mean	138.4	26.6	6.6	2.7

Notes:
[1] – This data is represented by individual sample stations during the RI that are closest to the transect locations first established for the 2003 event.
[2] – This data represents the average of two samples points (e.g. north and south of the tidal creek) per transect.

The Total PAH background or reference concentration for Ashley River sediments established during previous site investigations was reported to range from approximately 4 to 28 mg/kg. Based on comparisons with historical data, it is clear that PAH concentrations in surface sediments have steadily decreased with time, and have been within the reported background range over the past three sampling events. The average total PAH concentration in barge canal sediments reported in 2007 has decreased nearly 2 orders of magnitude from data reported during the RI. Moreover, a comparison of available aerial surveys indicate a net addition of approximately 0.80 acres of marsh grass since 2000.

Based on review of monitoring data, the MNR remedy for the barge canal sediments is adequately protective. Because total PAH concentrations are at background levels and unlikely to decrease further; and that marsh vegetation continues to develop due to the dominant depositional environment, no additional monitoring of sediment quality in the barge canal is warranted.

6.4.4 Review of the Ashley River Subaqueous Cap

The monitoring program for the Ashley River subaqueous cap required a baseline survey to document as-built conditions, and a six-month monitoring event following completion of construction. Thereafter, sand cap thickness monitoring was to continue on an annual basis

through the 2008 five-year review. The monitoring plan also includes a contingency for additional thickness measurements after significant storm events with high erosion capacity (e.g. tropical storms/hurricanes). Forty one thickness monitors were installed during construction of the subaqueous cap. Each thickness monitor consisted of an 18 inch stainless steel rod attached at the center of and perpendicular to a 36 inch diameter PVC disk. Each disk was placed on top of the geotextile fabric and covered with a minimum of 12 inches of sand to form the cap. The 18 inch stainless steel rod was connected to a chain, and a buoy was attached to the chain to facilitate locating the monitors.

Monitoring of the sand cap thickness has been conducted over 7 different events: December 2001 (baseline), March 2003 (6 months post-construction), and annual events in December 2003, 2004, 2005, 2006 and 2007. Analysis of thickness measurements revealed that repairs were needed to the cap in proximity to monitor locations TM-19, TM-31, TM-32 and TM-34 where the cap thickness was less than the 12 inch minimum design standard, and at locations where the cap geotextile liner had been exposed. A subaqueous cap repair plan was prepared in December 2007 by ERM on behalf of Magnolia. The repair work was performed by ENTACT in January 2008 on behalf of Magnolia, and the work was documented in a February 8, 2008 letter report from ERM.

Two general areas of the Ashley River subaqueous cap were repaired in January 2008. The northern area was repaired using a tracked mounted, long-reach backhoe operating from the shoreline. Approximately 28 tons of rip rap were installed along the outer edge of the cap to restore the crest height. Then about 145 tons of sand was placed over a 1,580 square foot area at a thickness of at least 15 inches. The southern area was repaired with a barge mounted clam shell crane. A second barge was used to transport the rip rap and sand to the repair area. Approximately 52 tons of rip rap were used to restore the crest height. Then about 220 tons of sand was placed over a 4,569 square foot area at a thickness of at least 15 inches. Further details regarding the cap repair work can be found in Appendix D – Documentation of January 2008 Subaqueous Cap Repair Activities (ERM, February 8, 2008).

Magnolia has conceptually evaluated several methods to either enhance or replace the Ashley River remedy with a more permanent solution that better integrates with the future uses of the riverfront. Continued annual sand cap thickness monitoring is recommended until such decisions are made final.

6.4.5 Review of the Engineered Soil Cover and Drainage Ditch Remedy

The Comprehensive Environmental Monitoring Plan required annual visual inspections of the engineered soil cover (ESC) and the reconstructed drainage ditches for structural integrity and performance. Inspections were typically conducted during the first quarter of each year, and have been conducted annually since 2004. A summary memorandum with supporting pictures were submitted for proper documentation.

The ESC has been repaired many times to repair depressions likely caused by vehicle traffic and shipping container storage. The ESC repair work generally consists of backfilling the depression with gravel, asphalt or vegetation and grading the area to promote positive

drainage. The Braswell Street, Milford Street and central drainage ditches were cleaned out in 2005 and 2006 to remove debris, dense stands of vegetation and sediment accumulation.

The Hagood Avenue drainage ditch is considered to be "off-site" and is therefore maintained by the City of Charleston. Inspection of this drainage ditch during the December 12, 2007 site visit showed signs of substantial sediment accumulation and rather dense vegetation.

6.5 Site Inspection

A five-year review site inspection was conducted on December 12-13, 2007. The inspection team consisted of: Craig Zeller (EPA Region 4), Mike Slenska (Beazer East), Michael Costa (Magnolia Development), Chuck Williams (SCDHEC) and Paul Bergstrand (SCDHEC). The five-year review checklist was completed during this site visit and is attached in Appendix A. A photographic log of the site inspection is attached as Appendix B. No major deficiencies or issues with the remedy were noted during the site inspection.

6.6 Interviews

As discussed above in Section 6.2, no formal interviews were conducted with local residents or community officials during this five-year review. Informal interviews were conducted with Beazer, SCDHEC, and Magnolia project personnel identified above in Section 6.5 at several times before, during and after the formal site inspection. These stakeholders have been actively involved in the O&M phase of this project, and concur with the process and recommendations of this Five-Year Review.

7.0 TECHNICAL ASSESSMENT

As recommended by the EPA Five-Year Review guidance document (e.g. OSWER Directive 9355.7-03B-P, June 2001), the framework for the technical assessment of the remedial action centers around answering the following key questions:

Question A: Is the remedy functioning as intended by the decision documents?

YES. The remedial action continues to operate and function as designed. The engineered soil cover and drainage ditches have been properly maintained to eliminate exposure and contaminant transport pathways. The MNR remedy for the barge canal shows net deposition, measureable vegetation encroachment, and declines in surface sediment concentrations. Sediment excavation in the north and south tidal marshes achieved performance standards and have been restored with vegetation comparable to reference sites. The Ashley River subaqueous cap has been monitored routinely, and was recently repaired to restore adequate cover in some limited erosional areas. Optimization of the NAPL and groundwater recovery system is underway to further refine source/plume areas and enhance NAPL recovery efficiencies.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?

YES. The exposure assumptions, toxicity data and remedial action objectives (RAOs) specified in the ROD are still relevant and applicable. The standardized risk assessment methodologies employed during the RI have not changed in a way that could affect the protectiveness of the remedy. The revised arsenic maximum contaminant level of 0.01 mg/l does not affect the selected remedy for this site since arsenic was not identified as a groundwater contaminant of concern in the ROD. The RAOs for the groundwater component focus on meeting objectives specified in EPA's technical impracticability guidance document, and do not specify numerical criteria for groundwater. Remedy performance data for the groundwater/NAPL component indicate the recovery system is achieving the established RAOs of: 1) removal or treatment of NAPL to the maximum extent practicable; 2) containment of potentially non-restorable NAPL source areas; and 3) containment and restoration of aqueous contaminant plumes.

Soil cleanup levels specified in the ROD were valid for a future industrial land-use. As discussed above, this site and several adjacent parcels will soon be redeveloped as a mixed use project known as Magnolia that will incorporate residential, commercial, retail, and civic space land use. The existing institutional controls (e.g. limited warranty deed) currently limit the future site use to an industrial exposure setting. Preliminary design and construction approaches for Magnolia indicate the existing ground surface will be filled approximately 18 to 24 inches, essentially providing an enhanced soil cover that will be properly maintained. EPA will continue to work closely with the Magnolia project team to ensure that the development activities are properly integrated with the site remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

NO. It appears that operation of the shallow NAPL recovery system in the OIA may be contributing to observed increases in constituent concentrations in MW-102A located adjacent to the barge canal. Additional soil borings, piezometers, and groundwater samples were collected in December 2007 to further characterize the subsurface conditions in the OIA. Beazer will submit a summary report regarding the findings of this additional investigation, and any recommendations for additional remedial activities. Additional investigation work will be conducted in the FTA to refine the delineation of NAPL source areas, and aqueous contaminant plumes in the vicinity of MW-12S and MW-100B. A majority of the site is now vacant since the former industrial and commercial businesses have been relocated to make room for redevelopment activities. Magnolia has indicated that an evaluation for soil vapor intrusion will be conducted, and vapor intrusion barriers will be installed during the construction work in areas of the site where warranted.

8.0 ISSUES

Issues identified during the second Five-Year Review for this site include the following:

- It appears that operation of the shallow NAPL recovery system in the OIA may be contributing to observed increases in constituent concentrations in MW-102A located adjacent to the barge canal. Additional soil borings, piezometers, and groundwater samples were collected in December 2007 to further characterize the subsurface

conditions in the OIA. Beazer will submit a summary report regarding the findings of this additional investigation, and any recommendations for additional remedial activities.

- Additional investigation work will be conducted in the FTA to refine NAPL source areas and aqueous contaminant plumes in the vicinity of MW-12S and MW-100B.

- Field evaluations are underway in the FTA to enhance NAPL recovery at several areas within the known capture zone.

- The site is now part of a 218 acre tract that will soon be redeveloped as the Magnolia, a mixed use project that will incorporate future residential, commercial, retail, and civic land use. Construction on the initial phases of Magnolia is expected to begin in the Spring/Summer 2008.

9.0 RECOMMENDATIONS AND FOLLOW UP ACTIONS

The following recommendations and follow-up actions are issued for this Five-Year Review:

- Continue to monitor, operate and maintain the NAPL and groundwater recovery systems in accordance with the recently revised plans. Implement EPA and SCDHEC approved follow up actions recommended in the supplemental OIA investigation report, and other reports as they relate to improving efficiency of NAPL recovery wells;

- Continue annual monitoring of the Ashley River subaqueous cap;

- Continue to inspect and maintain the engineered soil cover and drainage ditches while the construction of Magnolia is implemented. Remove sediment accumulation and vegetation from the Hagood Avenue drainage ditch;

- Discontinue sediment quality and vegetation encroachment monitoring in the barge canal;

- Continue to work closely with the Magnolia project team to ensure that future redevelopment activities are properly integrated with the completed remedy components, and the ongoing O&M activities.

The table on the following page outlines the follow up action, parties responsible for implementation, and anticipated schedule:

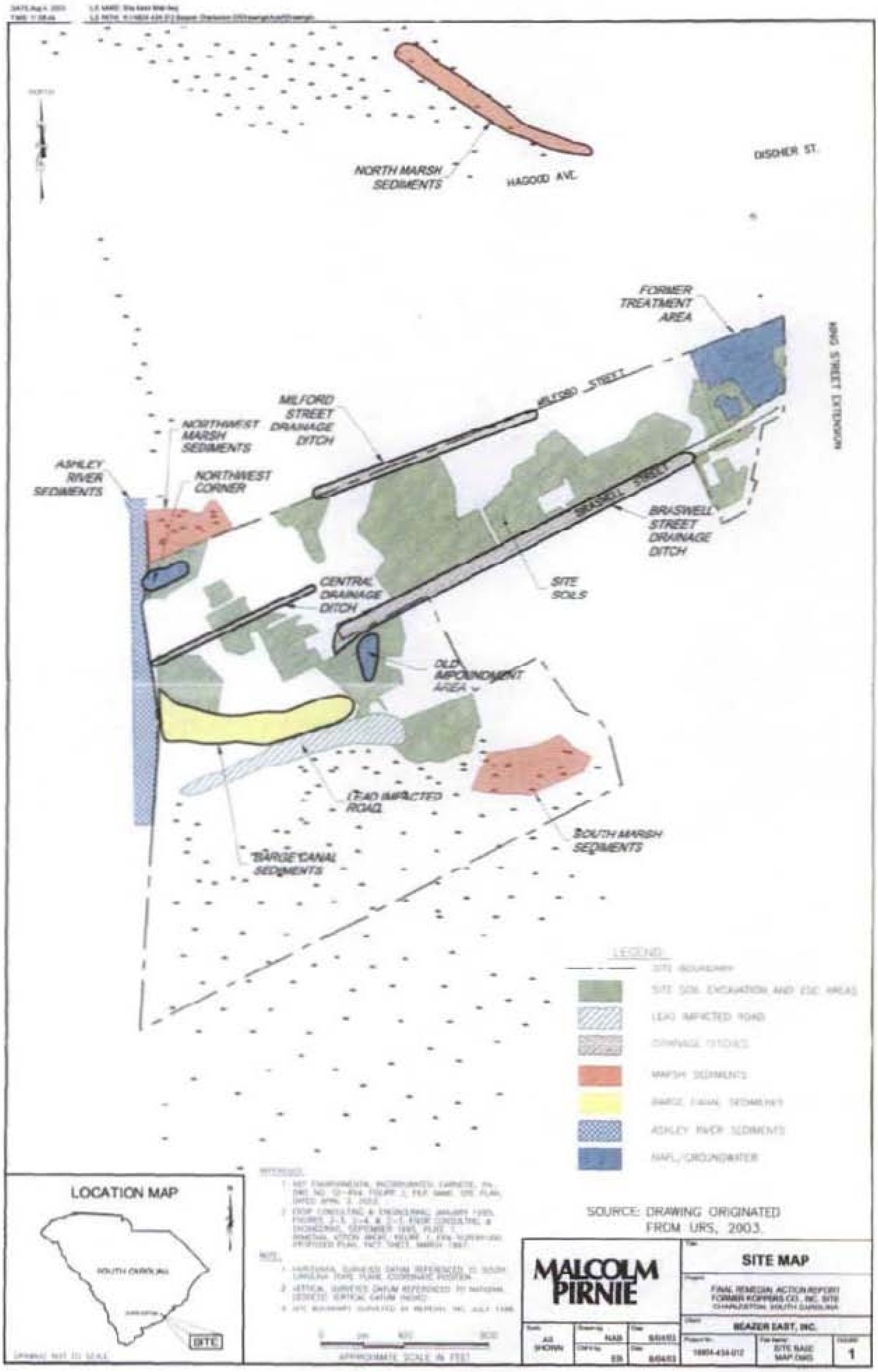
Follow Up Action	Party Responsible	Oversight Agency	Anticipated Completion Date	Follow Up Actions Affects Protectiveness (Y/N)	
Continue to operate, monitor & maintain NAPL/groundwater recovery systems	Beazer	EPA & SCHDEC	On-going	N	N
Implement EPA & SCDHEC approved follow up actions recommended in the supplemental OIA investigation report	Beazer	EPA & SCDHEC	12/31/08	N	N
Continue annual monitoring of the Ashley River subaqueous cap	Magnolia	EPA & SCDHEC	Repairs conducted in January 2008. Next annual event by 03/31/09.	N	N
Clean out Hagood Avenue drainage ditch	City of Charleston	EPA & SCDHEC	12/31/08	N	N
Continue to inspect & maintain soil cover and drainage ditches	Magnolia	EPA & SCDHEC	Next annual event by 03/31/09.	N	N
Discontinue sediment quality and vegetation encroachment in the barge canal	N/A	N/A	N/A	N	N
Continue to work with Magnolia to integrate redevelopment with site remedy and O&M	EPA	EPA & SCDHEC	N/A	N	N

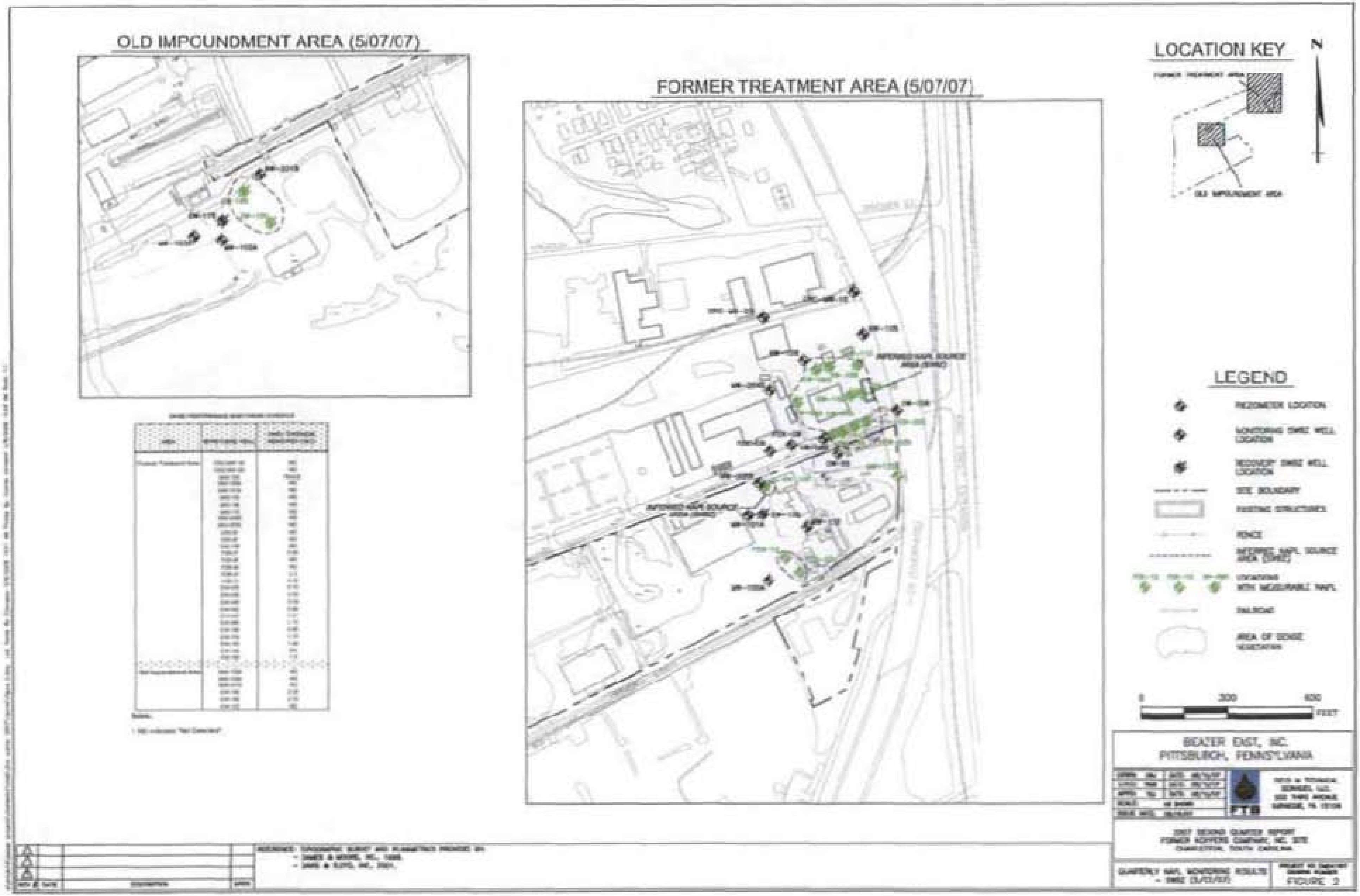
10.0 PROTECTIVENESS STATEMENT

The remedy implemented at the Koppers Co., Inc. site in Charleston, SC is currently considered adequately protective of human health and the environment; and human health and ecological exposure pathways that could result in unacceptable risks are being controlled.

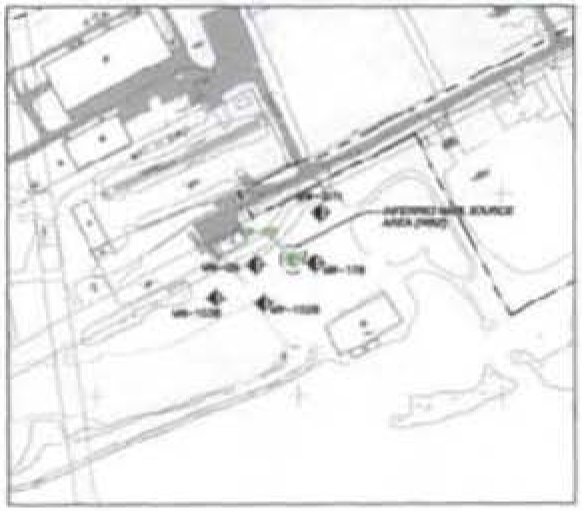
11.0 NEXT REVIEW

Pursuant to statutory requirements, the next Five-Year Review for this site will be conducted five years from the approval date of this document.


NORTH MARSH SEDIMENTS
HAGOOD AVE.
DISCHER ST.
FORMER TREATMENT AREA
KING STREET EXTENSION
MILFORD STREET
MILFORD STREET DRAINAGE DITCH
NORTHWEST MARSH SEDIMENTS
ASHLEY RIVER SEDIMENTS
NORTHWEST CORNER
BRASWELL STREET
BRASWELL STREET DRAINAGE DITCH
SITE SOILS
CENTRAL DRAINAGE DITCH
OLD IMPOUNDMENT AREA
LEAD IMPACTED ROAD
SOUTH MARSH SEDIMENTS
BARGE CANAL SEDIMENTS
LEGEND
SITE BOUNDARY
SITE SOIL EXCAVATION AND ESC AREAS
LEAD IMPACTED ROAD
DRAINAGE DITCHES
MARSH SEDIMENTS
BARGE CANAL SEDIMENTS
ASHLEY RIVER SEDIMENTS
NAPL/GROUNDWATER
LOCATION MAP
SOUTH CAROLINA
SITE
SOURCE: DRAWING ORIGINATED FROM URS, 2003.
MALCOLM PIRNIE
SITE MAP
FINAL REMEDIAL ACTION REPORT
FORMER KOPPERS CO., INC. SITE
CHARLESTON, SOUTH CAROLINA
BEAZER EAST, INC.
AS SHOWN
1
APPROXIMATE SCALE IN FEET


OLD IMPOUNDMENT AREA (5/07/07)
FORMER TREATMENT AREA (5/07/07)
LOCATION KEY
N
LEGEND
PIEZOMETER LOCATION
SITE BOUNDARY
EXISTING STRUCTURES
FENCE
LOCATIONS WITH MEASURABLE NAPL
RAILROAD
AREA OF DENSE VEGETATION
0
300
FEET
BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA
FTB
FIGURE 2

OLD IMPOUNDMENT AREA (5/07/07)



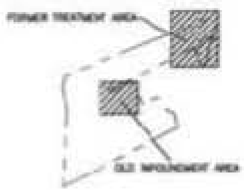
FORMER TREATMENT AREA (5/07/07)

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Notes:

[illegible]

LOCATION KEY



LEGEND

- IWBZ PIEZOMETER LOCATION
- IWBZ MONITORING WELL LOCATION
- IWBZ RECOVERY WELL LOCATION
- SITE BOUNDARY
- EXISTING STRUCTURES
- FENCE
- INFERRED NAPL SOURCE AREA (IWBZ)
- LOCATIONS WITH MEASURABLE NAPL

0 — 300 — 600 FEET

REFERENCE: TOPOGRAPHIC SURVEY AND PLANIMETRICS PROVIDED BY:

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

FTS

2007 SECOND QUARTER REPORT
FORMER KOPPERS COMPANY, INC. SITE
CHARLESTON, SOUTH CAROLINA

QUARTERLY NAPL MONITORING RESULTS - IWBZ (5/07/07)

FIGURE 3

Appendix A
Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Koppers Co., Inc. (Charleston Plant)	**Date of inspection: 12/12/07 & 12/13/07**
Location and Region: Charleston, SC - EPA R4	**EPA ID: SCD980310239**
Agency, office, or company leading the five-year review: Superfund Division – EPA R4	**Weather/temperature: Sunny; Mid 60's degrees F**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☒ Other: engineered soil cover, reconstructed surface water conveyances, tidal marsh excavation/revegetation, subaqueous capping, monitored natural recovery, solidification/stabilization.

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Mike Slenska, P.E._____ Environmental Mgr.____ _12/12/07___
   Name Title Date
   Interviewed: ☒ at site ☐ at office ☒ by phone, Phone no. 412.208.8867_____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed: ☐ at site ☐ at office ☐ by phone, Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _EPA Region 4 – Superfund Division
Contact _Craig Zeller, P.E._____ __RPM____ _12/12/07 404.562.8827
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _SC Department of Health & Environmental Control
Contact __Chuck Williams_____ ___Project Manager __12/12/07 803.896.4162
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _SC Department of Health & Environmental Control
Contact __Paul Bergstrand_____ ___Hydrogeologist __12/12/07 803.896.4016
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

Michael Costa - Magnolia Development; 843.577.0570

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☐ Up to date	☐ N/A
☒ As-built drawings	☒ Readily available	☐ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☐ Up to date	☐ N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☐ Up to date ☐ N/A
   ☒ Contingency plan/emergency response plan ☒ Readily available ☐ Up to date ☐ N/A
   Remarks_____

3. **O&M and OSHA Training Records** ☒ Readily available ☐ Up to date ☐ N/A
   Remarks_____

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☒ Up to date	☐ N/A
☐ Other permits_____	☐ Readily available	☐ Up to date	☐ N/A

Remarks_____

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks_____

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks_____

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks_____

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks_____

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☒ Up to date	☐ N/A

Remarks_____

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
    Remarks_____

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☒ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☒ Other_O&M contractor for PRP is Field & Technical Services; 200 Third Avenue, Carnegie, Pennsylvania 15106

2. **O&M Cost Records**

☐ Readily available ☒ Up to date
☐ Funding mechanism/agreement in place

Original O&M cost estimate ≈ $1.4 Million (30 Yr. NPV from ROD) ☐ Breakdown attached

Total annual cost by year for review period if available

From 01/01/05 To 12/31/05	≈ $330,000	☐ Breakdown attached
Date Date	Total cost	
From 01/01/06 To 12/31/06	≈ $300,000	☐ Breakdown attached
Date Date	Total cost	
From 01/01/07 To 12/31/07	≈$250,000	☐ Breakdown attached
Date Date	Total cost	
From _____ To _____	_____	☐ Breakdown attached
Date Date	Total cost	
From _____ To _____	_____	☐ Breakdown attached
Date Date	Total cost	

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: 1996 Feasibiity Study grossly underestimated annual O&M costs associated with NAPL/groundwater recovery and treatment system.

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A

Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A

Remarks

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Decision Document(s) call for ICs ☒ Yes ☐ No
If No, are ICs needed? ☐ Yes ☐ No
Have ICs been implemented? ☒ Yes ☐ No

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☒ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☒ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) IC's were provided to EPA when properly entered.
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☒ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks_____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks_____

2. **Land use changes on site** ☐ N/A
Remarks__Property is largely vacant now in preparation for development of Magnolia project.

3. **Land use changes off site** ☒ N/A
Remarks_____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks_____

B. Other Site Conditions

Remarks _____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks_____
   _____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____
   _____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ☒ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks_____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Areal extent_____ Depth_____
   ☐ Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   ☐ Erosion not evident
   Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks_____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored ☐ Evidence of breaching
   Frequency_____
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☒ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☒ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   ☐ Readily available ☒ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks_____

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
   - ☐ Metals removal ☒ Oil/water separation ☐ Bioremediation
   - ☐ Air stripping ☐ Carbon adsorbers
   - ☐ Filters_____
   - ☐ Additive (*e.g.*, chelation agent, flocculent)_____
   - ☐ Others_____
   - ☒ Good condition ☐ Needs Maintenance
   - ☐ Sampling ports properly marked and functional
   - ☐ Sampling/maintenance log displayed and up to date
   - ☐ Equipment properly identified
   - ☐ Quantity of groundwater treated annually_____
   - ☐ Quantity of surface water treated annually_____

   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional) ☐ N/A
   ☒ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels** ☐ N/A
   ☒ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances** ☐ N/A
   ☒ Good condition ☐ Needs Maintenance
   Remarks_____

5. **Treatment Building(s)** ☐ N/A
   ☒ Good condition (esp. roof and doorways) ☐ Needs repair
   ☐ Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy) ☐ N/A
   ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
   ☐ All required wells located ☐ Needs Maintenance
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   ☒ Is routinely submitted on time ☒ Is of acceptable quality

2. Monitoring data suggests:
   ☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation ☒ Applicable ☐ N/A

1. **Monitoring Wells** (natural attenuation remedy)
☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition
☐ All required wells located ☐ Needs Maintenance
Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Remedy has been properly implemented. All components are effective and functioning as designed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Operation and Maintenance procedures and results have been well documented in quarterly reports.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. _None.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. ___Underway. Please refer to Five-Year Review Report for description.

APPENDIX B
PHOTOGRAPHIC LOG

SITE INSPECTION
12/12/07 & 12/13/07

Supplemental Investigation Work in Old Impoundment Area

Soil Borings Collected from Old Impoundment Area

Temporary NAPL Collection Tank in Former Treatment Area

Treatment Trailers & Portable NAPL Pump

Restored North Tidal Marsh

Reconstructed Hagood Avenue Drainage Ditch

Reconstructed Central Drainage Ditch (Looking East)

Reconstructed Milford Street Drainage Ditch (Looking West)

Reconstructed Milford Street Drainage Ditch (Looking East)

Former Treatment Area

Extraction Well Vaults Along North Side of Milford Street

Restored South Tidal Marsh

Restored South Tidal Marsh

Restored South Tidal Marsh

Eastern End of Barge Canal Near Bulkhead

Middle Section of Barge Canal

View of Barge Canal Looking Toward Ashley River

Mouth of Barge Canal Near Confluence With Ashley River

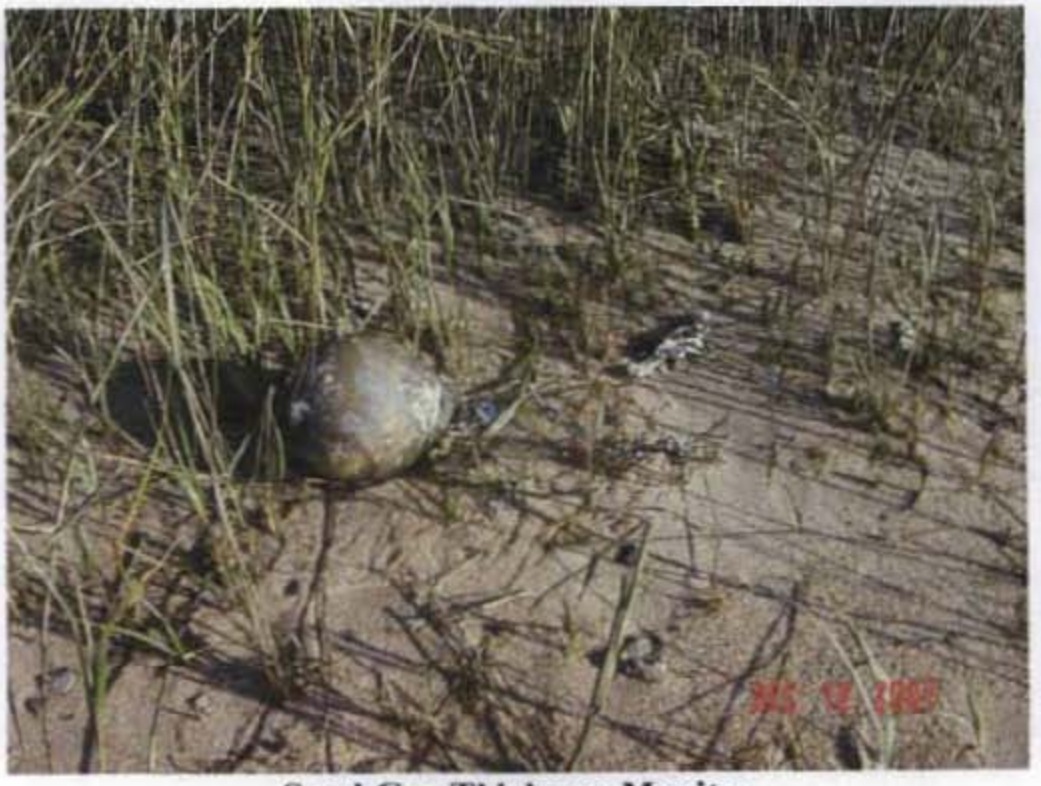
Barge Canal At High Tide

Braswell Street Drainage Ditch Discharge Near Barge Canal

Ashley River Cap (Looking South toward Parker Marine)

Ashley River Cap (Note New Layer of Pluff Mud)

Ashley River Cap (Looking North)



Sand Cap Thickness Monitor

Southern Section of Ashley River Cap

S/S Section of Ashley River Cap Near Parker Marine

Solidified/Stabilized Section of Ashley River Cap

Solidified/Stabilized Section of Ashley River Cap

APPENDIX C
Copy of Community Notification

US ENVIRONMENTAL PROTECTION
61 FORSYTH STE SW ATLANTA FEDERAL CENTER
Atlanta GA 30303

Number of Copies: 1

AFFIDAVIT OF PUBLICATION

The Post and Courier

State of South Carolina

County of Charleston

Personally appeared before me the undersigned advertising Clerk of the above indicated newspaper published in the City of Charleston, County and State aforesaid, who, being duly sworn, says that the advertisement of

(Copy attached)

appeared in the issues of said newspaper on the following day(s):

03/21/2008

at a cost of **$ 482.14**
Account# **R0526995**
Order# **C221D62J**
P.O. Number: **five year**

Subscribed and sworn to before me this 26th day of March A.D. 2008

Advertising Clerk

SHELLY DUBERRY NOTARY PUBLIC My Comm. Exp. 10-10-2013

NOTARY PUBLIC, SC
My Commission expires

Form 3020

THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY Announces a 2nd Five-Year Review For the Koppers Company, Inc., Site Charleston, (Charleston County) SC

A Five-Year Review is being conducted by the U.S. Environmental Protection Agency (EPA) of the cleanup up activities taken at the Koppers Company, Inc. site located in Charleston, Charleston County, South Carolina. The Superfund law requires EPA to evaluate the effectiveness of the remedy every five years to determine if the remedy remains adequately protective of human health and the environment.

The Koppers site is located west of the King Street extension, and is generally bounded by Milford Street on the north, Braswell Street on the south, and the Ashley River on the west. The Koppers Company treated wood on this parcel from 1940 until 1977. Wood-treating operations consisted primarily of treating raw lumber, utility poles and cross ties with creosote. Pentachlorophenol and copper chromium arsenate solution were also used as preservatives for short periods of time. The site was placed on the National Priorities List in December 1994. A cleanup remedy was selected through a Record of Decision signed in April 1998. Remedy implementation at the site generally involved excavation and off-site disposal of contaminated soils, placement of a protective soil cover, reconstruction of drainage ditches, restoration of adjacent tidal marshes, installation of a sand cap in the Ashley River, and long-term recovery of groundwater and creosote from the subsurface.

This is the second Five-Year Review for the Koppers site and it is expected to be completed by April 2008. A copy of the final review report will be placed in the Information Repository files located in the EPA Record Center, 11th Floor, 61 Forsyth Street, S.W. Atlanta, GA 30303, and the Charleston Main Library, 68 Calhoun Street, Charleston, South Carolina 29401.

The community is encouraged to contribute to this review by providing comments or concerns to EPA. If you have any technical questions, please contact Craig Zeller, EPA Remedial Project Manager, at (404) 562-8827; or if you have community related questions please call Linda Starks, EPA Community Involvement Coordinator at (404) 562-8487.

APPENDIX D
Documentation of Ashley River Subaqueous Cap Repair Activities January 2008

Environmental Resources Management

498 Wando Park Blvd.
Suite 100
Mt. Pleasant, SC 29464
(843) 856-4270
(843) 856-4283 (fax)

February 8, 2008

Mr. Craig Zeller, Remedial Project Manager
U.S. Environmental Protection Agency, Region 4
Atlanta Federal Center
61 Forsyth Street, S.W.
Atlanta, Georgia 30303-8960

Mr. Charles Williams
Bureau of Land and Waste Management
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201-1708

Subject: Documentation of January 2008 Subaqueous Cap Repair Activities
Koppers Co., Inc. (Charleston Plant) NPL Site
Charleston, South Carolina
ERM Project No.: 73614

Dear Messrs. Zeller and Williams:

This letter report has been prepared by Environmental Resources Management-Southeast, Inc. (ERM), on behalf of Ashley I, LLC (Ashley I), to document the subaqueous cap repair activities undertaken by Ashley I in January 2008. The activities were performed in accordance with the approved *Subaqueous Cap Repair Plan* (Plan), dated December 13, 2007. As identified in the Plan, there were two areas of the subaqueous cap that required repair. The northern area repairs took place on January 3 and 4, 2008. The southern area repairs took place from January 24 to February 1, 2008. The repairs performed in each area are discussed below.

Northern Area Subaqueous Cap Repair

ERM visited the northern subaqueous cap repair area, located in the vicinity of subaqueous cap monitoring location TM-19, on Thursday, January 3, 2008, to locate the repair area and to obtain pre-repair cap sand thickness measurements. ERM used a global positioning system

(GPS) unit to locate TM-19, the four corners of the cap repair area as defined in the Plan, and the edge of the cap rip rap in the vicinity of the repair area. These locations were staked with lathe to guide the repair activities. Upon locating these points, ERM measured the cap sand thickness within and outside of the repair area at several locations to document the pre-repair conditions. The results of these measurements are shown in Figure 1.

ENTACT Environmental Services, Inc. (ENTACT), under contract to Ashley I, performed the northern subaqueous cap repair activities on Friday, January 4, 2008 at low tide. ENTACT performed the repair activities with a track mounted, long-reach backhoe. ERM was present to observe and document the activities on behalf of Ashley I. ENTACT initiated the repair by placing rip rap along the edge of the cap to restore the rip rap height. After placing the rip rap, ENTACT placed washed sand within the repair area to bring the cap sand thickness up to at least 15 inches. Upon completion of the sand placement, ERM measured the sand thickness to confirm that the minimum 15 inches of sand was placed within the repair area. The size of the completed northern cap repair area was approximately 1,102 square feet. The rip rap placement area and the results of the post-repair sand thickness measurements are shown in Figure 2. Photographs of the repair activities are also provided in Attachment 1.

Upon completion of the repair activities in the TM-19 area, ENTACT also placed sand on an area of exposed geotextile fabric. The exposed fabric was located near the edge of the vegetation, approximately midway between measuring points TM-16 and TM-17, over an area of approximately five square feet. A minimum of 15 inches of sand was also placed in this area. Since there was additional sand available, sand was also placed northward from the area of exposed fabric to measuring point TM-16. The size of the completed cap repair area in this region was approximately 478 square feet. Photographs of these activities are also provided in Attachment 1.

A total of 37.79 tons of rip rap and 167.38 tons of washed, medium-grained sand were delivered to complete the northern subaqueous cap repair. About 28 tons of rip rap and 145 tons of sand were used to restore the cap to the minimum design thickness. The remaining 10 tons of rip rap and 22 tons of sand were used for the southern area cap repair. Weight tickets for the materials delivered for the northern area cap repair are provided in Attachment 2.

Southern Area Subaqueous Cap Repair

ERM visited the southern subaqueous cap repair area on Thursday and Friday, January 24 and 25, 2008, to locate the repair area and to obtain pre-repair cap sand thickness measurements. ERM used a GPS unit to locate the repair area as defined in the Plan, the corners of the cap repair area, and the edge of the cap rip rap in the vicinity of the repair area. These locations were staked with lathe to guide the repair activities. Upon locating these points, ERM measured the cap sand thickness within and outside of the repair area at several locations to document the pre-repair conditions. The thickness measurements obtained within the Plan cap repair area indicated that cap repairs were generally needed further north than defined in the Plan. The results of the pre-repair cap sand thickness measurements are shown in the attached Figure 3. Based upon the sand thickness measurements, the repair area was reconfigured to restore a larger area of the cap than originally planned.

Parker Marine Contracting Corporation (Parker), under contract to Ashley I, performed the southern subaqueous cap repair activities from Monday, January 28 to Thursday, January 31, 2008 at low tide. Parker performed the repair activities with a barge mounted, clamshell crane. A second barge was used to transport the rip rap and sand to the repair area. ERM was present to observe and document the activities on behalf of Ashley I. Parker initiated the repair by placing rip rap along the edge of the cap to restore the rip rap height. After placing the rip rap, Parker placed washed sand within the repair area to bring the cap sand thickness up to at least 15 inches. Upon completion of the sand placement, ERM measured the sand thickness to confirm that the minimum 15 inches of sand was placed within the repair area. The size of the completed southern cap repair area was approximately 4,569 square feet. The rip rap placement area and the results of the post-repair sand thickness measurements are shown in Figure 4. Figure 4 also shows the original and final cap repair area configurations. Photographs of the repair activities are also provided in Attachment 3.

A total of 42.39 tons of rip rap and 198.24 tons of washed, medium-grained sand were delivered to complete the southern subaqueous cap repair. About 52 tons of rip rap and 220 tons of sand were used to restore the cap to the minimum design thickness, using the remaining rip rap and sand from the northern area repair. Weight tickets for the materials delivered for the southern area cap repair are provided in Attachment 4.

Conclusions

Based upon the post-repair sand thickness measurements, the repair activities in both the northern and southern subaqueous cap repair areas were successful in restoring the protective rip rap and the subaqueous cap sand thickness to more than the minimum design thickness of 12 inches. An additional round of cap thickness measurements will also be obtained during the upcoming annual subaqueous cap monitoring activities. The annual subaqueous cap monitoring is anticipated to occur prior to February 15, 2008.

If you have any questions concerning this letter report or need additional information, please do not hesitate to call Scott Yankey at (843) 416-1214.

Sincerely,

Thomas M. Wilson

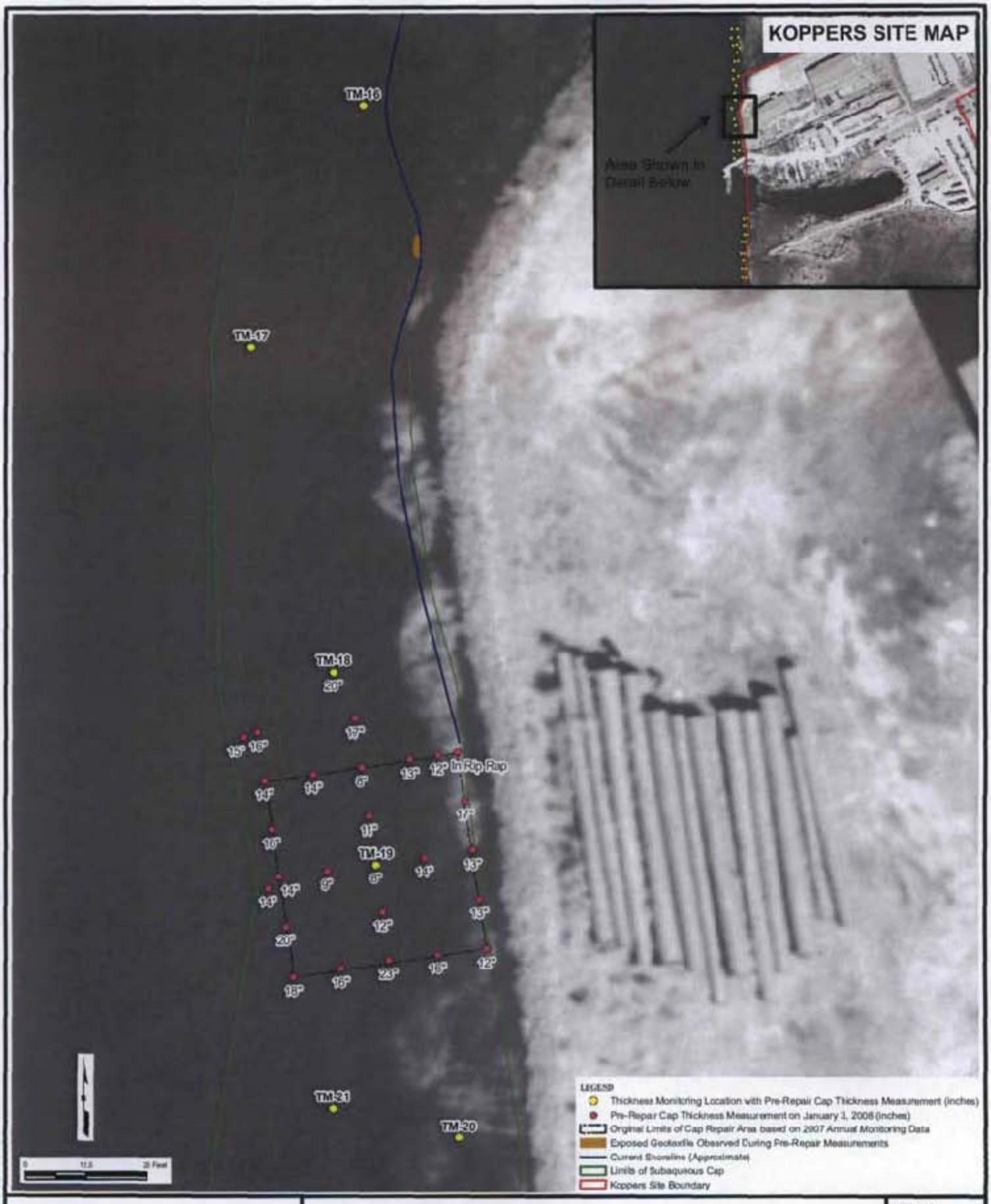
Thomas M. Wilson, P.G.
Principal-in-Charge

A. Scott Yankey

A. Scott Yankey
Project Manager

Attachments

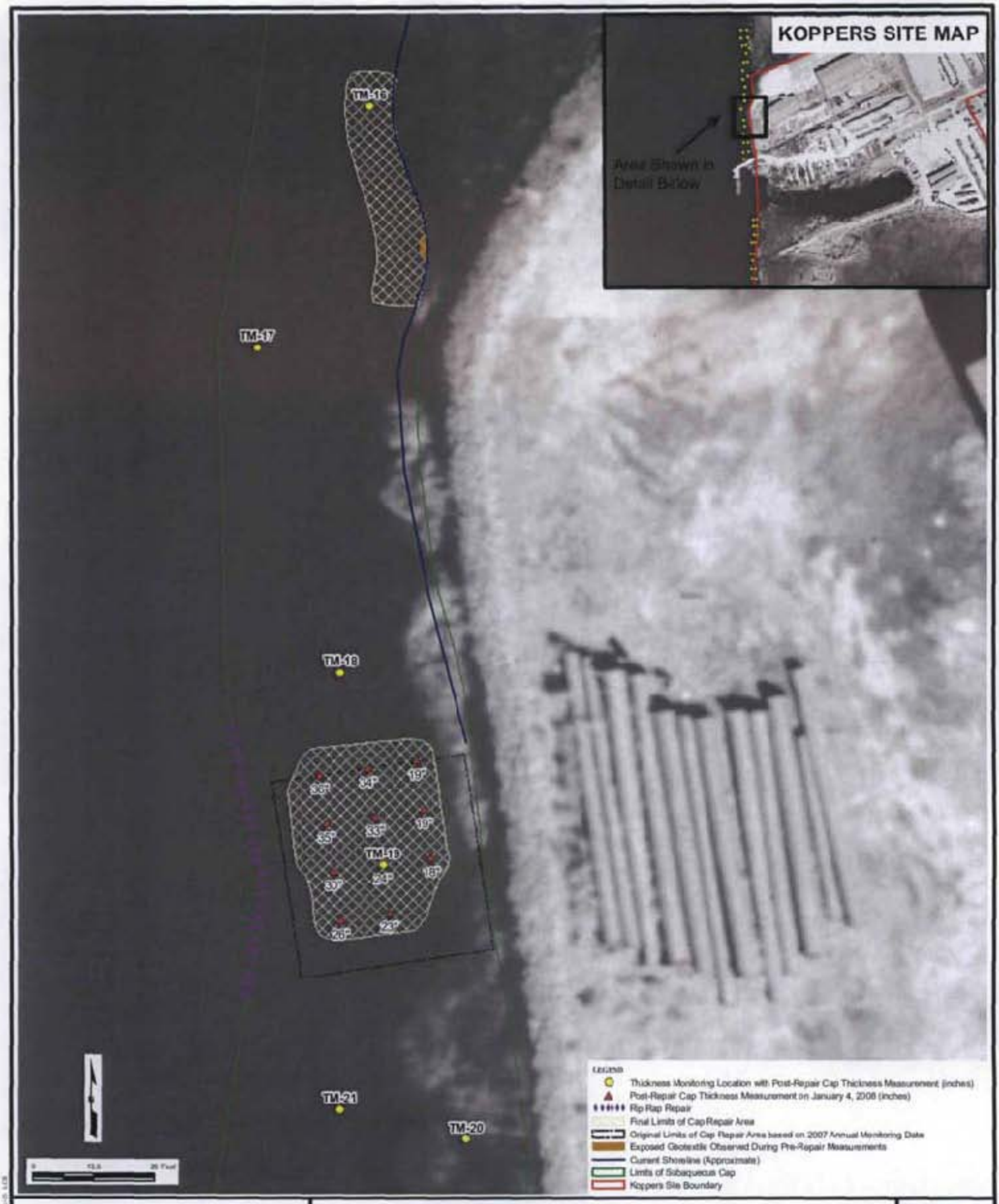
cc: Michael Costa, Magnolia Development, LLC
Mike Slenska, Beazer East, Inc.
Scott Freeman, Ashley II (electronic version)



Environmental Resources Management

Cap Thickness
Prior to Subaqueous Cap Repair
Northern Repair Area, Koppers Site
Charleston, South Carolina

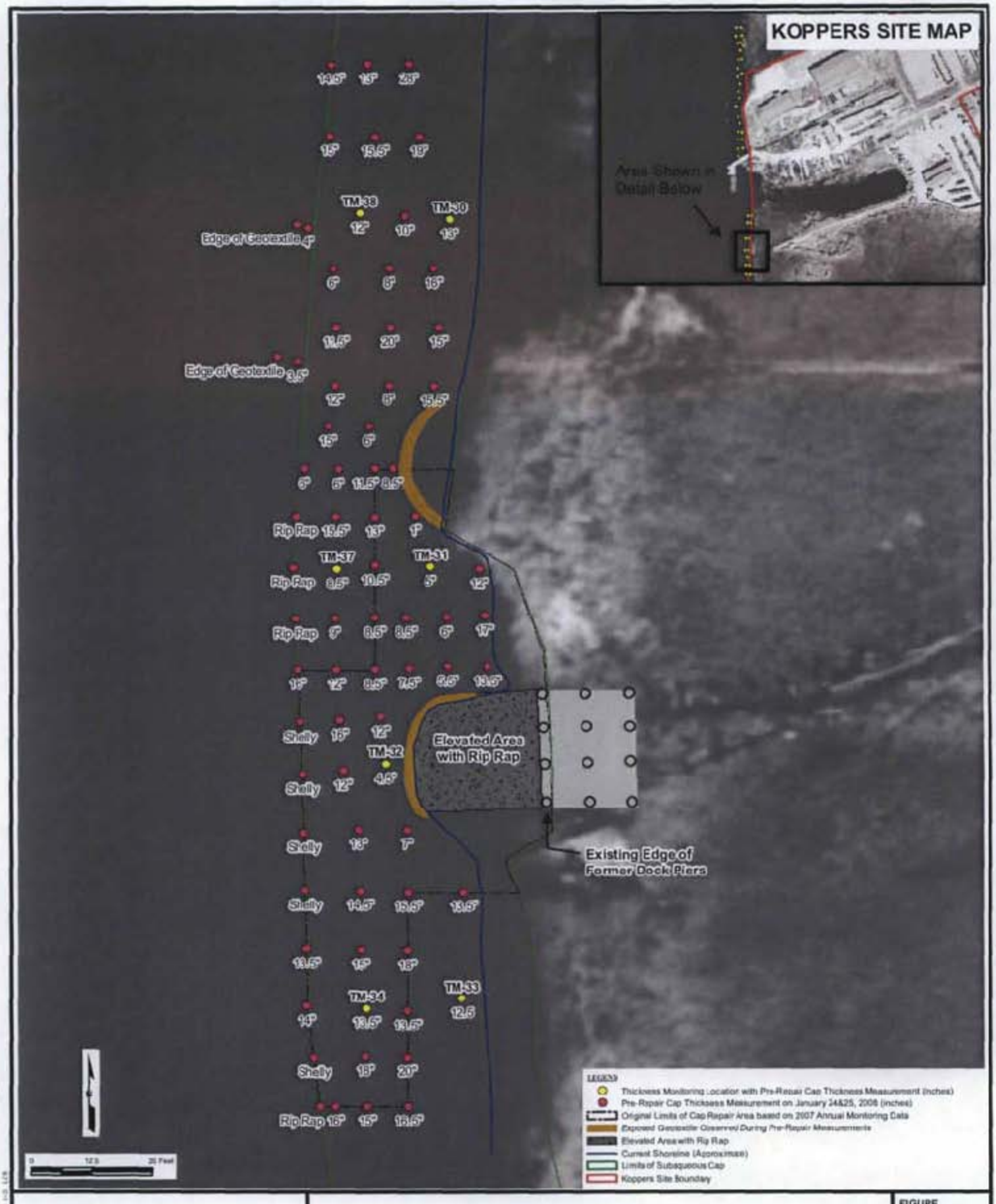
FIGURE
1



Environmental Resources Management

Cap Thickness
After Subaqueous Cap Repair
Northern Repair Area, Koppers Site
Charleston, South Carolina

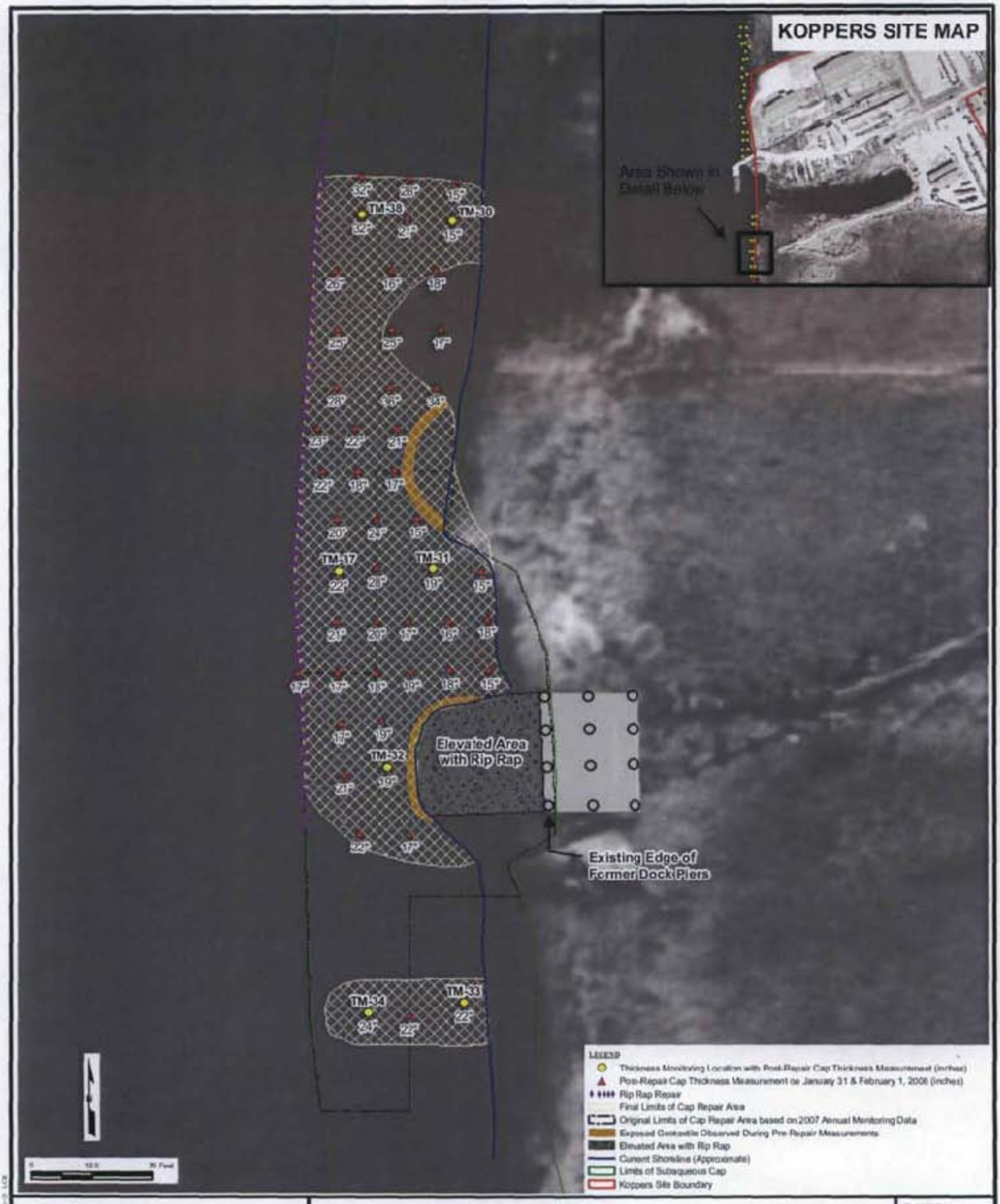
FIGURE
2



ERM Environmental Resources Management

Cap Thickness
Prior to Subaqueous Cap Repair
Southern Repair Area, Koppers Site
Charleston, South Carolina

FIGURE
3



ERM Environmental Resources Management

Cap Thickness
After Subaqueous Cap Repair
Southern Repair Area, Koppers Site
Charleston, South Carolina

FIGURE
4

Attachment 1
Northern Cap Repair Photographs

View of Repair Area and TM-19, Looking NW

View of Repair Area and TM-19, Looking SW

Checking Reach of Equipment to Place Rip Rap

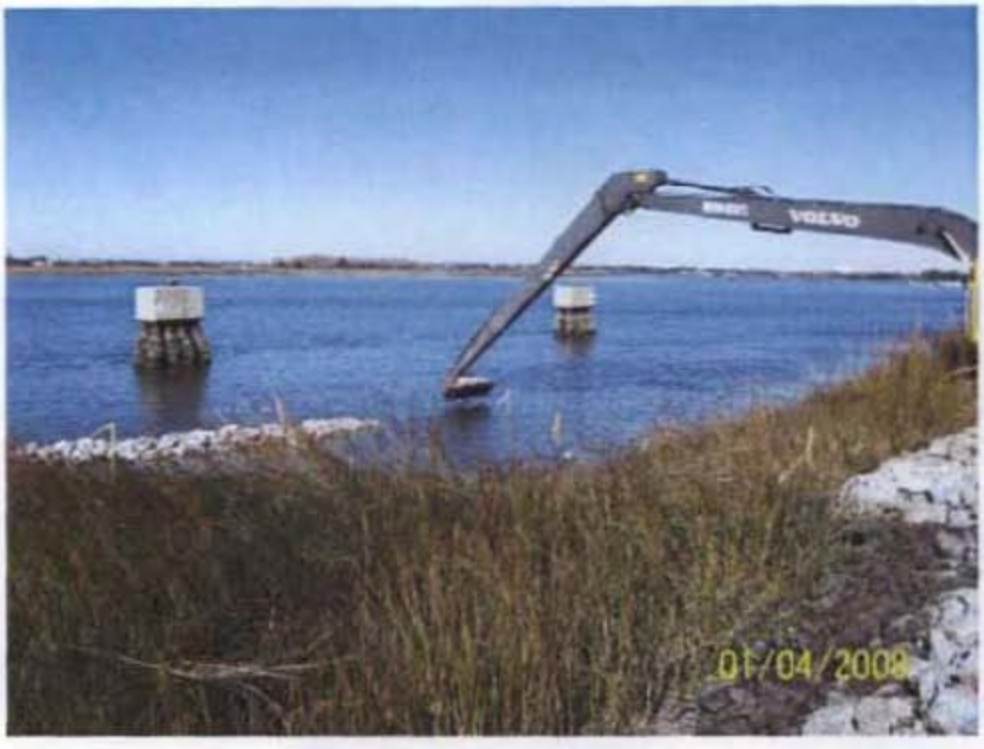
Rip Rap Delivered to Site

Begin Placing Rip Rap along Edge of Subaqueous Cap

Continue Placing Rip Rap along Edge of Subaqueous Cap

Continue Placing Rip Rap along Edge of Subaqueous Cap

View of Rip Rap Placement, Looking SSW



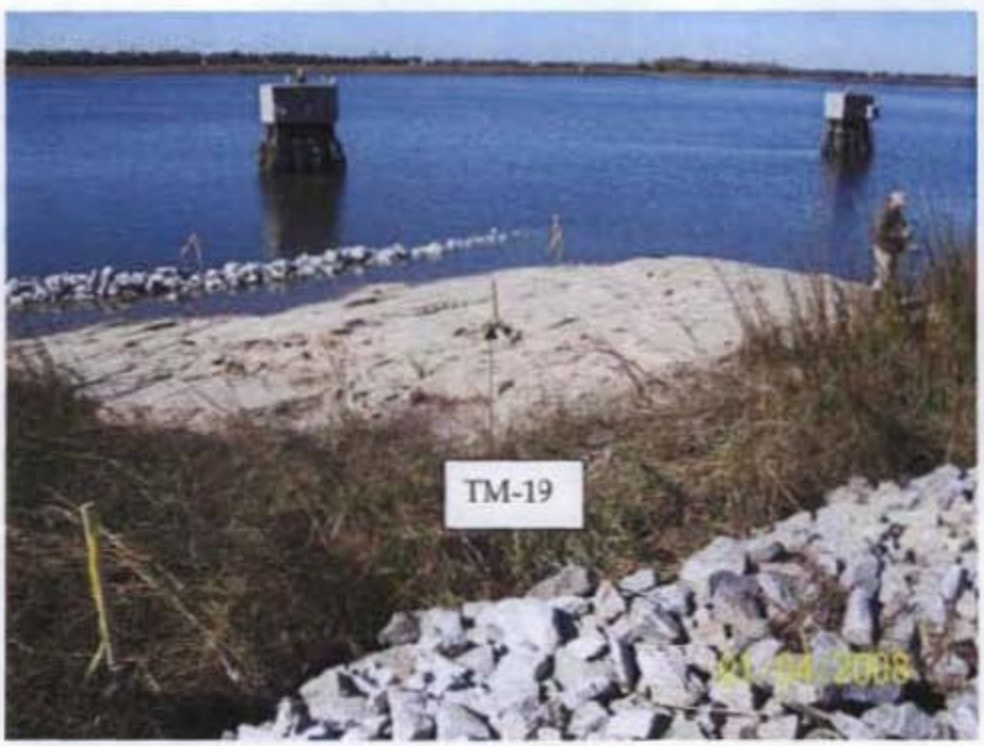
Continue Placing Rip Rap along Edge of Subaqueous Cap

Begin Placing Sand on Repair Area

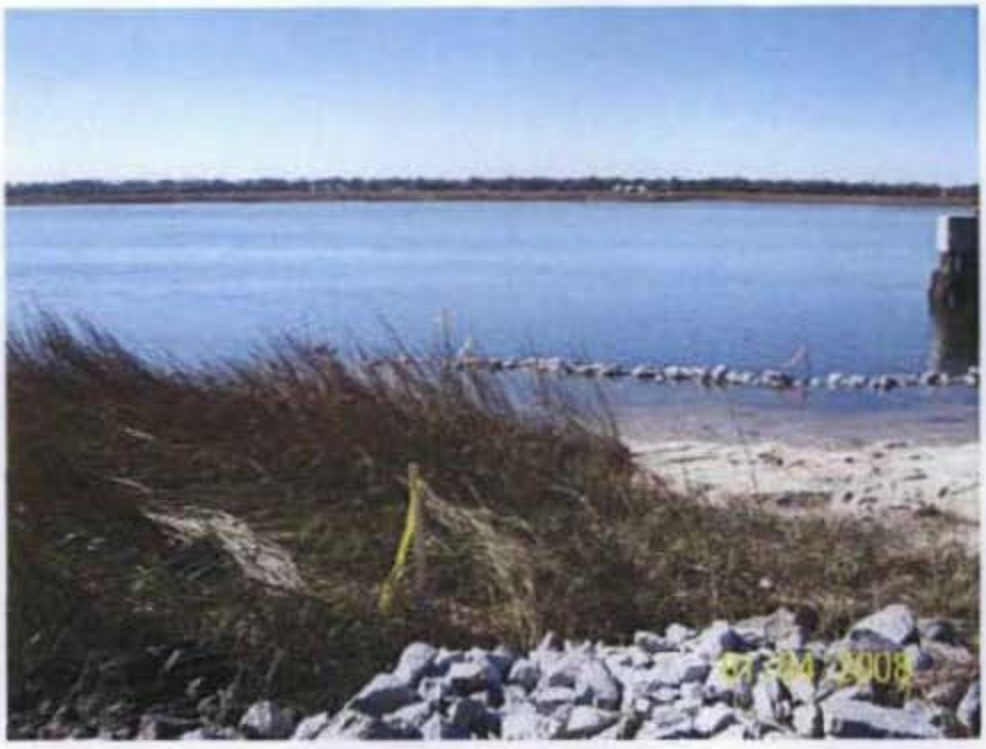
Southern Edge of Repair Area, Looking W

Adding Rip Rap along Edge of Cap after Sand Placement

View of Final Repair Area, Looking S



Measuring Sand Thickness in Repair Area

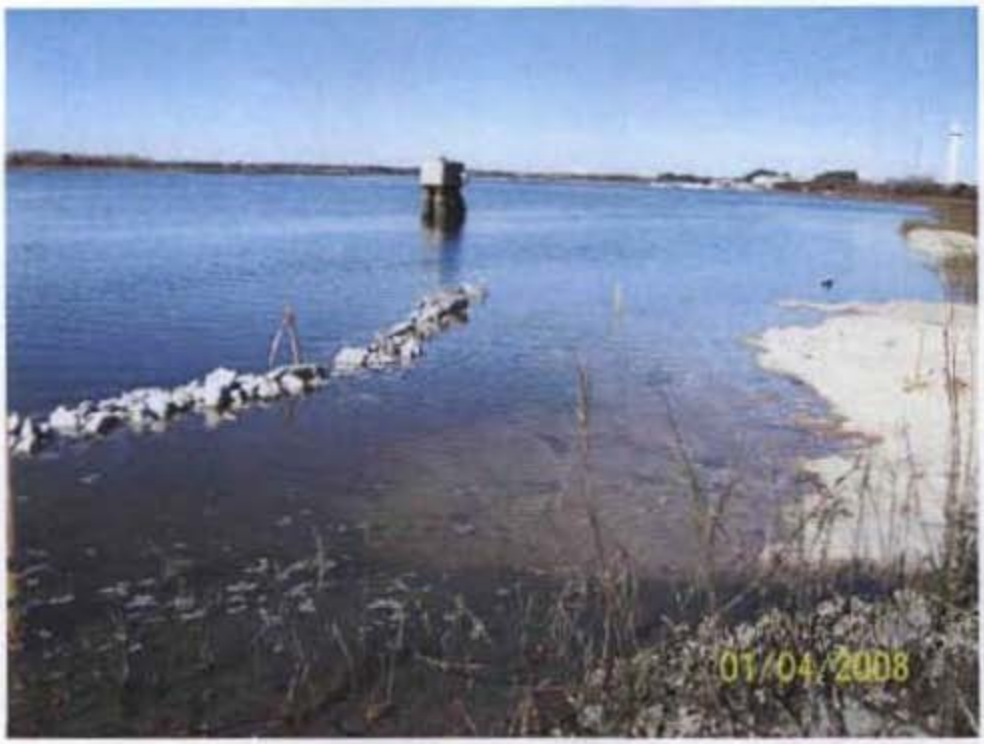


Southern End of Repair Area, Looking W

Middle of Repair Area, Looking NW

Northern End of Repair Area, Looking W

Repair Area, Looking N



Repair Area, Looking N

Covering Exposed Geotextile, Looking S

Continuing Sand Placement in Area of Exposed Geotextile

Continuing Sand Placement North of Exposed Geotextile

Final Repair in Exposed Geotextile Area, Looking S

Final Repair North of Exposed Geotextile Area, Looking N

Attachment 2
Northern Cap Repair Material Weight Tickets

Murray Sand Company, Inc.

89969

Date 1-4-08 #233758

Customer Enact Services

Job Ashley River Remidation, CHARleston

Pit Murray Sand Material FA-10

Hauled by MS Truck # 88 Truck Type

Load Count 1 C.Y. 22.64 TONS Hours Rental

Start Time Stop Time

Signature: X

Murray Sand Company, Inc.

90236

Date 1-4-08

Customer Enact

Job Ashley River Rem. Braswell St.

Pit Yard Material FA-10

Hauled by Murray Truck # 11 Truck Type Tri

Load Count 1 C.Y. 2504 Hours Rental

Start Time Stop Time

Signature: X

JAN 03'08 08:54 No.

Murray Sand Co.,Inc.
ID 938 LOADER 1
Truck # 88
22.54 ton

Enact
Braswell
St
FA-10
89969

Enact
90236
N. Chas.

25.04 ton

02/06/2008 18:08 FAX 8438510050 MURRAY SAND CO. 002/005

Murray Sand Company, Inc.

Date 1-4-08 89799 ord#033758

Customer ENTACT SERVICES

Job BRASWELL ST.

Pit Murry Sand Material FA-10

Hauled by Murry Sand Truck # 95 Truck Type TT

Load Count 1 tons 24.82 Hours Rental

Start Time Stop Time

Signature: X

Murray Sand Company, Inc.

Date 1/4/08 90301

Customer Entact Services MS, WT, TKT

Job Braswell ST CHAS. Job# 1576

Pit Murray Sand Material FA-10

Hauled by M.S. Truck # 12 Truck Type Tx

Load Count 1 cy 23.42 tons Hours Rental

Start Time Stop Time

Signature: X

Entact
FA-10
Braswell
St
#95

Entact
FA-10
Braswell
St
#12

02/06/2008 18:08 FAX 8438510050 MURRAY SAND CO. 003/005

Murray Sand Company, Inc.

89994

Date 1-4-08

Customer Entact Services

Job Charleston

Pit MS Yard Material FA-10

Hauled by MS Truck # 98 Truck Type Frl

Load Count 1 ~~C.Y.~~ 21.54 tons Hours Rental

Start Time Stop Time

Signature: X

Murray Sand Company, Inc.

90948

Date 1-4-08

Customer Entact

Job Braswell St

Pit Murray Sand Pit Material FA-10

Hauled by Murray Truck # 97 Truck Type Tri-A

Load Count 1 C.Y. 21.52 Hours Rental

Start Time Stop Time

Signature: X

98

Entact
Braswell St.
98 FA-10

90948

Entact
FA-10
Braswell St
97

02/06/2008 18:08 FAX 8438510050 MURRAY SAND CO. 004/005

Martin Marietta Materials

COPY

WARNING
Read important health information on reverse.
PRECAUCION
Ver información importante para la salud en el reverso.

Visit eRocks™ at www.martinmarietta.com

Ticket#: 20222514

Sold To: 242208 Job# 2422080009 01
MURRAY SAND CO INC
156 CHECKERBOARD RD
SUMMERVILLE SC 29483

Sold From: 51207 North Columbia
803-786-4510
MON-FRI 6:30AM-5:00PM
FAX 803 734-2073

Date: 01/04/08 Time: 07:07 PO No:
Truck:
Hauler: MMA976 MURRAY SAND 96

Job / Dest. Information
2008 REQUIREMENTS
N COLUMBIA
N CHARLESTON
CONTACT BRASWELL STREET

Lot#

	Today Lds	Today Quantity	To Date Quantity
Job:	2	37.79	37.79
Dest:	2	37.79	37.79

Product Number: 0027
Description: RIPRAP
Sec. Prod 0.00

	Lbs	Tons
Gross:	78,060 (1)	39.43
Tare:	40,560 (1)	20.28
Net:	38,300	19.15
QTY:	19.15 Ton	

Cash Sale
Matl $
Tax $ SCRICH
Haul $
Payment Recvd By:
Total $
Max GVW: 80,600.00

Additional Information:

Weighperson:

Driver: TARE EXP. 3/4/08

Customer:

20222514

Martin Marietta Materials Standard Terms and Conditions apply (copy available at Site Office) CONTROL NUMBER

Martin Marietta Materials

COPY

WARNING
Read important health information on reverse.
PRECAUCIÓN
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Visit eRocks™ at www.martinmarietta.com

Ticket#: 20222509

Sold To: 242208 Job# 2422080009 01
MURRAY SAND CO INC
156 CHECKERBOARD RD
SUMMERVILLE SC 29483

Sold From: 51207 North Columbia
803-786-4510
MON-FRI 6:30AM-5:00PM
FAX 803 734-2073

Date: 01/04/08 Time: 07:45 PO No:
Truck:
Hauler: MMA819 MURRY # 91

Job / Dest. Information
CONTACT
2008 REQUIREMENTS
N COLUMBIA
N CHARLESTON
233756

Lot#

	Today Lds	Today Quantity	To Date Quantity
Job:	1	18.64	18.64
Dest:	1	18.64	18.64

Product Number: 0027
Description: RIPRAP
Sec. Prod 0.00

	Lbs	Tons
Gross:	77,060 (1)	38.53
Tare:	39,780 (1)	19.89
Net:	37,280	18.64
QTY:	18.64 Ton	

Cash Sale
Matl $
Tax $ SCRICH
Haul $
Payment Recvd By:
Total $
Max GVW: 80,600.00

Additional Information:

Weighperson:

Driver: EXP 3/4/08

Customer:

20222509

Attachment 3
Southern Cap Repair Photographs

View of Repair Area Looking North, Measuring Pre-Repair Cap Thickness

View of Repair Area Looking South

View of Repair Area Looking South, Thickness Monitors Staked

View of Barge Equipment, Looking West from Lead Road

Begin Placing Rip Rap along Edge of Subaqueous Cap, Looking NNW

Continue Placing Rip Rap along Edge of Subaqueous Cap, Looking South

Begin Restoring Cap Sand Thickness, Looking North

Continue Placing Sand Around TM-33 and TM-34, Looking West

Continue Sand Placement, Looking North

Final View of Repair Area Prior to Measuring Sand Thickness, Looking N

Attachment 4
Southern Cap Repair Material Weight Tickets

Martin Marietta Materials

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Ticket#: 20712256

Sold To: 242208 Job# 2422080087 02
MURRAY SAND CO INC
156 CHECKERBOARD RD
SUMMERVILLE SC 29483

Sold From: 51206 Cayce
803-796-8520
MON-FRI 5AM TO 5PM

Date: 01/25/08 Time: Truck: 06:34 PO No:

Hauler: M597 MURRAY SAND

Job / Dest. Information
2008 REQUIREMENTS
CAYCE QUARRY
CHARLESTON
Lot#

	Lds	Today Quantity	To Date Quantity
Job:			
Dest: 1	1	21.78	42.79
Dest: 1	1	21.78	21.78

Product Number: 9027

Description: RIPRAP

Sec. Prod 0.00

	Lbs	Tons
Gross:	69,680	34.84
Tare:	26,120	13.06
Net:	(1)	

43,560 21.78

QTY: 21.78 Ton

Cash Sale

Matl $

Tax $ SCLEXI

Haul$

Payment Recvd By:

Total$

Mak GVM: 69,860.00

Additional Information:

Weighperson: JOHN F MCCARTY JR

Magnolia Development
68 Braswell St. Chas.

TARE EXP: MARCH 20

Driver:

Customer:

20712256

CONTROL NUMBER

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Martin Marietta Materials

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Ticket#: 20712260

Sold To: 242308 Job# 2422080087 02
MURRAY SAND CO INC
156 CHECKERBOARD RD
SUMMERVILLE SC 29483

Sold From: 51208 Cayce
803-796-8320
MON-FRI 5AM TO 5PM

Date: 01/25/08 Time: 07:05 PO No:
Truck:
Hauler: MS90 MURRAY SAND

Job / Dest. Information
2008 REQUIREMENTS
CAYCE QUARRY
CHASLESTON
Lot# Municipal Development

	Today Lds	Today Quantity	To Date Quantity
Job:			
Dest: 2	2	42.39	63.40
2	2	42.39	42.39
Product Number:	0027		
Description:	RIPRAP		
Sec. Prod			0.00

	Lbs	Tons
Gross:	67,920	33.96
Tare:	26,700	13.35
Net:	41,220	20.61
QTY:	20.61	Ton

Cash Sale
Matl $
Tax $ SCLEXI
Haul$
Payment Recvd By
Total$
Max GVW: 69,860.00

Additional Information:

Weighperson: JOHN P MCCARTY JR

Driver: TARE EXP: MARCH 20 JH

Customer:

20712260
CONTROL NUMBER

Martin Marietta Materials Standard Terms and Conditions apply (copy available at Site Office).

BBF
Raleigh, NC - TO REORDER THIS FORM PLEASE CALL (919) 872-4544

MURRAY MINES, INC.
2696 HIGHWAY 176 SOUTH
SUMMERVILLE, S.C. 29483
PHONE (843) 873-0056

TIME 08:02am DATE 01 29 08

TICKET NO. 2900251

GROSS WEIGHT	68040	GROSS
TARE WEIGHT	22640	GROSS
NET WEIGHT	45400	GROSS
NET WEIGHT	22.69	NET

$1.10

TRUCK ID.....88..... CUSTOMER. Murray Sand...

WEIGHMASTER.....D.B..... RECEIVED BY. L. Hopkins

1/29/08

Magnolia Development
68 Braswell St, Charleston

Magnolia
Development
N. Charleston

MURRAY MINES, INC.
2696 HIGHWAY 17A SOUTH
SUMMERVILLE, S.C. 29483
PHONE (843) 873-0056

TIME 08:39am DATE 01 29 08

TICKET NO. 419655

5/10

GROSS WEIGHT	65800	GROSS
TARE WEIGHT	25760	GROSS
NET WEIGHT	39240	GROSS
NET WEIGHT	19.62NET	

TRUCK ID. 20 CUSTOMER Murray Sand

WEIGHMASTER MB RECEIVED BY TH

TH DLSB 1/29/08

786

MURRAY MINES, INC.
2606 HIGHWAY 17A SOUTH
SUMMERVILLE, S.C. 29483
PHONE (843) 873-0056

TIME DATE
10:51am 01 29 08

TICKET NO. 2908356

GROSS WEIGHT	68580	GROSS
TARE WEIGHT	22640	GROSS
NET WEIGHT	45940	GROSS
NET WEIGHT	22.97	NET

TRUCK ID..... 85 .....

CUSTOMER Magnolia Land.....

WEIGHMASTER..... WB .....

RECEIVED BY .....

MAGNOLIA DeVelopment
#68 Braswell St, CHARleston

magnolia Development
N. Charleston

MURRAY MINES, INC.
2696 HIGHWAY 17A SOUTH
SUMMERVILLE, S.C. 29483
PHONE (843) 873-0056

TIME 10:54am DATE 01 29 08

TICKET NO. 20080359

GROSS WEIGHT	69300	GROSS
TARE WEIGHT	26500	GROSS
NET WEIGHT	42,340	GROSS
NET WEIGHT	21.16NET	

7.10

TRUCK ID. 94 CUSTOMER Murray Sand

WEIGHMASTER. W.B. RECEIVED BY. J.H.

MURRAY MINES, INC.
2696 HIGHWAY 178 SOUTH
SUMMERVILLE, S.C. 29483
PHONE (843) 873-2056

TIME 11:00am DATE 01 30 00

TICKET NO. 2904219

Bed Fa-10

GROSS WEIGHT	69140	GROSS
TARE WEIGHT	22900	GROSS
NET WEIGHT	46240	GROSS
NET WEIGHT	23.12	NET

TRUCK ID. 93 CUSTOMER M. SAND

WEIGHMASTER TM RECEIVED BY

magnolia Development
N. Charleston
68 Braswell St.

MURRAY MINES, INC.
2606 HIGHWAY 17A SOUTH
SUMMERVILLE, S.C. 29483
PHONE (843) 873-0056

TIME 12:08pm DATE 01 20 98

TICKET NO. 230433

Fa-10

GROSS WEIGHT	67120	GROSS
TARE WEIGHT	23140	GROSS
NET WEIGHT	43980	GROSS
NET WEIGHT	21.99	NET

TRUCK ID. 84 CUSTOMER. M. SAINT

WEIGHMASTER. RM RECEIVED BY.

MURRAY MINES, INC.
2636 HIGHWAY 178 SOUTH
SUMMERVILLE, S.C. 29483
PHONE (843) 873-2056

TIME DATE
01:19pm 01 30 08

TICKET NO. 2908440

Fa-10

GROSS WEIGHT	66040	GROSS
TARE WEIGHT	22900	GROSS
NET WEIGHT	45140	GROSS
NET WEIGHT	22.57	NET

TRUCK ID..... 93 ..... CUSTOMER..... M. SAND .....

WEIGHMASTER..... F.C. ..... RECEIVED BY.....

Magnolia Development
N. Charleston
68 Braswell St.

MURRAY MINES, INC.
2696 HIGHWAY 17A SOUTH
SUMMERVILLE, S.C. 29483
PHONE (843) 873-0056

TIME 02:29PM DATE 01 30 08

TICKET NO. 2990448

FAIO

GROSS WEIGHT	66150	GROSS
TARE WEIGHT	23240	GROSS
NET WEIGHT	42940	GROSS
NET WEIGHT	21.48	NET

TRUCK ID. 24 CUSTOMER Murray Land

WEIGHMASTER. DLS RECEIVED BY.

Murray Sand Company, Inc.

90825

Date 01-30-08

Customer Magnolia Development

Job 64 Braswell St. N. Charleston

Pit Yard Material FA-10

Hauled by M.S. Truck # 84 Truck Type TRI

Load Count 1 Load Tons @ 22.18 Hours Rental

Start Time Stop Time

Signature X

Magnolia Development
64 Braswell St.
N. Charleston
29485

JAN 30 08 09:45:00AM
Murray Sand Co. Inc.
ID 938, LOADER 1
Truck #84
FA~10 22.18 ton
PROD12 FA~10

APPENDIX E
2007 Barge Canal
Sediment Sampling Report

2007 Barge Canal Sediment Sampling Report

Submitted to:

Beazer East, Inc.
One Oxford Centre, Suite 3000
Pittsburgh, PA 15219

Submitted by:

AMEC Earth and Environmental, Inc.
2 Robbins Road
Westford, MA 01886

December 2007

Project # 4-7200-2100

1.0 Introduction

This sediment sampling report, prepared on behalf of Beazer East, Inc. (Beazer), describes the methods that were used to monitor the concentration of polynuclear aromatic hydrocarbons (PAHs) in surficial sediments and to monitor the encroachment of vegetation into the Barge Canal that is located at the former Koppers Site in Charleston, South Carolina (Site). This sampling was requested by the United States Environmental Protection Agency (USEPA) as part of its Five Year Review. Sediments have continued to accumulate in the Barge Canal to the point where a majority of the canal, except for a small tidal channel in the middle of the canal, is exposed at low water. Additionally, salt marsh vegetation continues to encroach on to the canal. The purpose of this sediment sampling report is to document that the concentrations of PAHs in sediments that have accumulated in the Barge Canal are equal to or less than the concentrations detected in the previous sampling.

1.1 Site Background

The Site is located on the Ashley River in Charleston, South Carolina (Figure 1). Detailed descriptions of Site history, surroundings and previous investigation can be found in the ENSR Remedial Investigation Report (ENSR 1994). A more detailed description of the Barge Canal, the portion of the Site that is the subject of this sampling plan, is provided below.

1.2 Barge Canal Background

The Barge Canal is located in the southwestern portion of the Site. Historical photographs show that a canal existed in this general area of the Site prior to November 1941 though the canal present at that time was small and located on the northern edge of the Barge Canal that exists today. Over the next approximately 40 years the canal filled with sediments and much of it was overgrown with marsh vegetation. In November 1984 Southern Dredging dredged this portion of the marsh and created the Barge Canal. The Barge Canal was approximately 1000 feet long and 150 feet wide (Figure 1). When originally dredged, it had a depth of 8 feet below mean low water (MLLW), though sedimentation since that time has significantly decreased the depth throughout the canal. The change in depth has been documented in three bathymetric surveys completed in the last ten years (summarized in URS 2001). Barge Canal sediments were collected and analyzed for PAHs and other constituents during the Remedial Investigation (RI) (ENSR 1994). Sediments were also collected and analyzed for PAHs in 2003 and 2004 during the post Record of Decision sediment accumulation monitoring (AMEC 2003 and AMEC 2004).

2.0 Methods

The field work specified in the sampling plan (AMEC 2007) was conducted on October 22 - 23, 2007. Sampling locations were designated at the 2003 sample locations. Surface sediment grab samples locations were accessed from the shoreline by laying 2' x 8' plywood sheets end-to-end toward the center of the mud flat at low tide. All sample locations are presented in Figure 1. As in 2003 and 2004, the location strategy was to have five paired samples, one on the northern side of the canal (samples designated as "N") and one on the southern side of the canal (samples designated as "S").

Each individual sediment sampling location was determined using a GPS telemetry unit with sub-meter accuracy in order ensure that the 2007 sampling locations were in the immediate vicinity of the 2003

locations. In all, ten 0-6" sediment samples were obtained from the pre-selected locations. As stipulated in the sampling plan, all surface samples represented a composite of five 0-6" intervals taken within a 1.5-meter radius. These samples were taken with a clean stainless steel trowel and composited in a stainless steel bowl. As observed in 2003 and 2004, all surface samples were the same color and consistency, a very fine charcoal gray silty-clay mud (sample logs are shown in Attachment A). Following visual inspection, sediment samples were composited, placed in a clean glass jar from the laboratory, sealed, labeled, packaged, placed in a ice cooler and shipped to STL Laboratories (Pittsburgh, PA) for analysis of PAHs (Method 8270C), total organic carbon (Method 9060), percent solids and grain size (ASTM D422). A summary of the data validation and the raw laboratory results are provided as Attachment B.

The shoreline vegetation was determined by Aero-Data Corp using a March 15, 2006 aerial photograph (most recent aerial photograph available). This more recent vegetation contour was compared to the vegetation contours developed by Davis and Floyd in 2000 and 2004 along with the contour developed by ENSR in 1994.

3.0 Results

The results of the field survey are discussed below in terms of the field observations, physical tests, sediment chemistry, and vegetation encroachment.

3.1 Barge Canal Sediments

Table 1 presents the physical test results for total organic carbon (%), solids (%) and grain size for each 0-6" sediment sample (the raw data are provided in Attachment B). Total organic carbon, percent solids and the predominant grain size (silts and clays) averaged 3.9, 24.4 and 92.8 percent, respectively. As observed in 2003 and 2004, all three physicochemical parameters were uniform (again with the exception of one sample, 2-N, located immediately down-gradient of two 3' stormwater culverts). These three years of congruent data strongly suggest that most of the sediment accumulating within the Barge Canal is derived from the same source: suspended sediment from the Ashley River being carried in and deposited during slack tide.

Table 2 presents the total PAH concentration (mg/kg) for each bulk sediment sample. The 2004, 2003 and the 1994 bulk sediment data are also presented so that the PAH concentrations can be put in perspective over time (see Figure 1 for exact locations). The arithmetic mean of each north/south transect pair (paired along a north/south transect) is also calculated (1994 values obtained from individually tabulated data in the 1994 ENSR report). Based on the comparison with historical data, it is clear that PAH concentrations in sediment are decreasing over time. Based on individual sample results, all of the means for the paired (north/south) 2007 locations are at the lower end of the background range of concentrations (3.8 – 28 mg/kg) reported for the Ashley River (URS, 2001). The overall site-wide arithmetic average is 2.7 mg/kg, which is two times lower than the 2004 site-wide mean of 6.6 mg/kg and ten times lower then the 2003 site-wide mean of 26.6 mg/kg (Table 2). The 2007 site-wide average is also over sixty times lower than that calculated for the 0-6" samples taken during the 1994 Remedial Investigation. The results indicate that the overall total PAH concentrations within the Barge Canal surface sediments are decreasing over time.

3.3 Lateral Encroachment of Shoreline Vegetation

The borders of the encroaching vegetation were located in detail using a 2006 aerial photograph (Figure 2). The most visible change appears to be the large area of marsh grass that has developed at the mouth of the Barge Canal (southern spit of land at the entrance to the Ashley River). A comparison of the all the shoreline vegetation surveys is shown in Figure 3. Overall, a net addition of 0.80 acres of marsh grass has accumulated since the 2000 aerial survey. This calculation does not include several small marsh grass "islets" that have sporadically emerged throughout the center of the canal. When the 2006 shoreline vegetation is compared to the 2004 shoreline, a 0.09 acre increase in vegetation is estimated. While the rate of encroachment from 2004 to 2006 may seem slower then in previous years, it may be that the quality of the 2006 photograph made it hard to actually identify all vegetated area because shoreline vegetation observed during the 2007 sampling event appears to indicate a significant increase in vegetation encroachment from the 2006 aerial photography. The encroachment of vegetation is very evident by comparing the site photographs from the 2003, 2004, and the 2007 sampling rounds (Figure 4).

4.0 Discussion

Based on a perspective of time and location, the current 2007 analytical data, along with those data of 2004 and 2003, show that bulk total PAH concentrations are decreasing over time. This supports the conclusion made in the 2003 and 2004 Monitoring Plan Reports (AMEC 2003 and AMEC 2004), which stated that concentrations are lower than those observed in surface sediments of the previous sampling rounds. Additionally, since all of the 2007 surface sediment concentrations are lower than those of 2004, the evidence of a decreasing trend in concentration, most likely due to migration of cleaner sediment from the Ashley River, grows stronger.

A general east-to-west trend of decreasing PAH concentration that was seen in the 1994 data set was also not evident in the shallow sediments during either of the 2003, 2004, or 2007 sampling rounds. Current levels of total PAH in the 0-6" sediment intervals throughout the Barge Canal are now well within the range of concentrations observed at background locations within the Ashley River. Additionally, the average site-wide concentration of 2.7 mg/kg is fifty times less than the average 0-6" site-wide concentration of 167.3 mg/kg observed in 1994. This suggests that over the past 13 years, the elevated PAH concentrations observed in the Barge Canal furthest from the Ashley River have now been covered by sediments with PAH levels that are similar to background for the Ashley River.

Previously bathymetry surveys have shown a clear net accumulation of sediment, principally based on observed increases seen in topographic elevations (AMEC 2004 and URS 2001). The increase in sediment bed elevation has provided shallow water conditions that are conducive to the lateral migration of marsh grass, resulting in a net inward expansion of 0.80 acres of wetland vegetation since 2000. This accumulation was also visibly evident to the AMEC field crew, particularly the emergence of many islands of marsh grass in the center of the Barge Canal. This growth of marsh grass in the deeper portion of the canal should serve to further impede both the incoming and outgoing tidal flow, which will likely accelerate the conversion of the canal from an "open water" environment to a more productive "sea grass" wetland.

5.0 Conclusion

Field observations made during the 2007 survey showed that the boundary of the shoreline vegetation has changed dramatically in just three years of time. Small islets of marsh grass have continued to emerge in the deeper portions of the canal and the islets observed in 2004 have grown into larger islands. The chemical data show that the concentrations of total PAH in surface sediments continue to decrease. The concentration of total PAH in the recently deposited sediments are at the lower end of the range of total PAH concentration cited for the Ashley River so additional decreases may not occur because the concentrations of PAHs in sediments is equal to the concentrations of the incoming suspended Ashley River Sediments. In summary, because total PAH concentrations are at background levels and are unlikely to decrease further, and the marshland vegetation encroachment continues to develop, therefore, no additional monitoring of sediments in the Barge Canal is required.

6.0 References

AMEC, 2003. Barge Canal Sedimentation Monitoring Plan. Final Report for Y2003. Former Koppers Wood Treating Site, Charleston, SC. June 9 2003.

AMEC, 2004. Barge Canal Sedimentation Monitoring Plan. Final Report for Y2004. Former Koppers Wood Treating Site, Charleston, SC. July 26, 2004.

AMEC, 2007. Final 2007 Barge Canal Sediment Sampling Plan. Former Kopper's Wood Treating Site, Charleston, SC. September 2007

ENSR, 1994. Remedial Investigation Report. Former Koppers Site, Charleston, SC. November 1994.

URS, 2001. Technical Report to Support Proposed Barge Canal Revised Remedy. URS/Dames and Moore, May 2001.

Table 1

Barge Canal Surface Sediments:
Physicochemical Measurements from 2007 Sampling

AMEC ID	TOC (%)	Solids (%)	Grain Size (% Silt and Clay)
1-N	3.5	22.2	96.7
1-S	3.7	23.9	94.9
2-N	3.3	27.5	85.1
2-S	3.5	24.8	91.0
3-N	4.1	24.9	95.8
3-S	4.0	23.5	92.3
4-N	4.0	25.7	92.3
4-S	3.9	23.4	96.5
5-N	4.4	24.7	89.7
5-S	4.7	23.6	93.9
Site-Wide Mean	**3.9**	**24.4**	**92.8**

Table 2

Total PAH in Barge Canal Surface Sediments: Change in Concentrations vs. Time

	2007 Data		2004 Data		2003 Data	
AMEC ID	**Total PAH (mg/kg)**	**Mean of North/South Transect (mg/kg)**	**Total PAH (mg/kg)**	**Mean of North/South Transect (mg/kg)**	**Total PAH (mg/kg)**	**Mean of North/South Transect (mg/kg)**
1-N 1-S	1.8 2.5	2.1	5.7 4.8	5.3	14.2 11.3	12.8
2-N 2-S	2.3 4.1	3.2	4.0 6.1	5.1	6.3 18.1	12.2
3-N 3-S	5.7 4.6	5.2	11.4 6.7	9.1	10.8 24.5	17.7
4-N 4-S	1.6 1.8	1.7	8.4 3.7	6.1	18.5 6.8	12.7
5-N 5-S	1.5 1.0	1.3	5.8 9.1	7.4	148.9 6.1	77.5
Site-Wide Mean		**2.7**		**6.6**		**26.6**

1994 Data	
ENSR ID	**ENSR Total PAH (mg/kg)**
SD-40	362.0
SD-86	166.0
SD-85	52.0
SD-38	81.0
SD-65	31.0
	167.3

BARGE CANAL SEDIMENT SAMPLING LOCATIONS

Barge Canal, Charleston, SC

- 1994 Sampling Locations
- 2003 & 2007 Sampling Locations
- 2004 Sampling Locations

FIGURE 1

N

0 120

Feet

amec

AMEC Earth & Environmental, Inc.
2 Robbins Road
Westford, MA 01886
(978) 692-9090

I:\Besser\Charleston_SC\Task2\MXD\Figure1.mxd I:\Besser\Charleston_SC\Task2\Export\Figure1.pdf November 28, 2007 DWN: AP CHKD DJW/GP

Aerial Imagery Source: Aero-Data Corp., 2000

2006
SHORELINE / VEGETATION LINE

Barge Canal, Charleston, SC

2006 Shoreline/Vegetation Line

FIGURE 2

N

0 120

Feet

amec

AMEC Earth & Environmental, Inc.
2 Robbins Road
Westford, MA 01886
(978) 692-9090

H:\Besser\Charleston_SC\Task2\MXD\Figure2.mxd H:\Besser\Charleston_SC\Task2\Export\Figure2.pdf November 28, 2007 DWN: AP CHKD: SJK/BMP

Aerial Imagery Source: USDA/USGS, 2006

SHORELINE / VEGETATION LINES

Barge Canal, Charleston, SC

Shoreline/Vegetation Line
- 2006
- 2004
- 2000
- 1994

FIGURE 3

N

0 120

Feet

amec

AMEC Earth & Environmental, inc.
2 Robbins Road
Westford, MA 01886
(978)692-9090

H:\Beaufort\Charleston_SC\Task3\MXD\Figure3.mxd H:\Beaufort\Charleston_SC\Task3\Export\Figure3.tif November 28, 2007 DWN: AP CHKD: DJKK/MP

Aerial Imagery Source: Kucera, 2004

2003 view of center channel of the Canal at Low Tide

2004 View of the Center Channel of the Canal at Low Tide

2007 View of the Center Channel of the Canal at Low Tide

Figure 4
Comparison of Shoreline Vegetation 2003, 2004, and 2007
Former Koppers Site – Charleston, SC
Barge Canal

Attachment A

Sample Logs

amec

Sediment Sample Log

Project Name: Beazer- Charleston (Barge Canal) **Sample Location:** 1N

Project Number: 472002100 **Sampled by:** JR/NL **Sample Time:** 12:30

Total Depth: 6 inches **Date Started:** 10/22/07 **Date Finished:** 10/22/07

Recovery/Penetration: 6 inches **Water Depth:** 6 inches

Comments: Sediment surface contained numerous gastropods (whelks). Petroleum like odor observed at shoreline, none observed at sample location.

Description of Sample Location

Depth (inches)	Sample No.	Sample Depth	Sediment Description	OVA	Depth (inches)
0	1N	0-6"	Dk gray silt and clay	NA	
6					

amec

Sediment Sample Log

Project Name: Beazer- Charleston (Barge Canal) **Sample Location:** 1S

Project Number: 472002100 **Sampled by:** JR/NL **Sample Time:** 9:45

Total Depth: 6 inches **Date Started:** 10/22/07 **Date Finished:** 10/22/07

Recovery/Penetration: 6 inches **Water Depth:** 6 inches

Comments: Sediment surface contained numerous gastropods (whelks)

Description of Sample Location

Depth (inches)	Sample No.	Sample Depth	Sediment Description	OVA	Depth (inches)
0	1S	0-6"	Dk gray silt and clay	NA	
6					

amec

Sediment Sample Log

Project Name: Beazer- Charleston (Barge Canal) **Sample Location:** 2N

Project Number: 472002100 **Sampled by:** JR/NL **Sample Time:** 12:45

Total Depth: 6 inches **Date Started:** 10/22/07 **Date Finished:** 10/22/07

Recovery/Penetration: 6 inches **Water Depth:** 6 inches

Comments: Sediment surface contained numerous gastropods (whelks).

Description of Sample Location

Depth (inches)	Sample No.	Sample Depth	Sediment Description	OVA	Depth (inches)
0					
	2N	0-6"	Dk gray silt and clay	NA	
6					

Sediment Sample Log

Project Name: Beazer- Charleston (Barge Canal) **Sample Location:** 2S

Project Number: 472002100 **Sampled by:** JR/NL **Sample Time:** 10:10

Total Depth: 6 inches **Date Started:** 10/22/07 **Date Finished:** 10/22/07

Recovery/Penetration: 6 inches **Water Depth:** 6 inches

Comments: Sediment surface contained numerous gastropods (whelks).

Description of Sample Location

Depth (inches)	Sample No.	Sample Depth	Sediment Description	OVA	Depth (inches)
0	2S	0-6"	Dk gray silt and clay	NA	
6					

amec

Sediment Sample Log

Project Name: Beazer- Charleston (Barge Canal) **Sample Location:** 3N

Project Number: 472002100 **Sampled by:** JR/NL **Sample Time:** 10:15

Total Depth: 6 inches **Date Started:** 10/23/07 **Date Finished:** 10/23/07

Recovery/Penetration: 6 inches **Water Depth:** 6 inches

Comments: Sediment surface contained numerous gastropods (whelks). MS/MSD collected at this location.

Description of Sample Location

Depth (inches)	Sample No.	Sample Depth	Sediment Description	OVA	Depth (inches)
0					
	3N	0-6"	Dk gray silt and clay	NA	
6					

amec

Sediment Sample Log

Project Name: Beazer- Charleston (Barge Canal) **Sample Location:** 3S

Project Number: 472002100 **Sampled by:** JR/NL **Sample Time:** 10:30

Total Depth: 6 inches **Date Started:** 10/22/07 **Date Finished:** 10/22/07

Recovery/Penetration: 6 inches **Water Depth:** 6 inches

Comments: Sediment surface contained numerous gastropods (whelks).

Description of Sample Location

Depth (inches)	Sample No.	Sample Depth	Sediment Description	OVA	Depth (inches)
0					
	3S	0-6"	Dk gray silt and clay	NA	
6					

amec

Sediment Sample Log

Project Name: Beazer- Charleston (Barge Canal) **Sample Location:** 4N

Project Number: 472002100 **Sampled by:** JR/NL **Sample Time:** 10:50

Total Depth: 6 inches **Date Started:** 10/23/07 **Date Finished:** 10/23/07

Recovery/Penetration: 6 inches **Water Depth:** 6 inches

Comments: *Sediment surface contained numerous gastropods (whelks).*

Description of Sample Location

Depth (inches)	Sample No.	Sample Depth	Sediment Description	OVA	Depth (inches)
0	4N	0-6"	Dk gray silt and clay	NA	
6					

amec

Sediment Sample Log

Project Name: Beazer- Charleston (Barge Canal) **Sample Location:** 4S

Project Number: 472002100 **Sampled by:** JR/NL **Sample Time:** 11:05

Total Depth: 6 inches **Date Started:** 10/22/07 **Date Finished:** 10/22/07

Recovery/Penetration: 6 inches **Water Depth:** 6 inches

Comments: Sediment surface contained numerous gastropods (whelks).

Description of Sample Location

Depth (inches)	Sample No.	Sample Depth	Sediment Description	OVA	Depth (inches)
0	4S	0-6"	Dk gray silt and clay	NA	
6					

Sediment Sample Log

Project Name: Beazer- Charleston (Barge Canal) **Sample Location:** 5N

Project Number: 472002100 **Sampled by:** JR/NL **Sample Time:** 11:15

Total Depth: 6 inches **Date Started:** 10/23/07 **Date Finished:** 10/23/07

Recovery/Penetration: 6 inches **Water Depth:** 6 inches

Comments: Sample location was within the marsh grass.

Description of Sample Location

Depth (inches)	Sample No.	Sample Depth	Sediment Description	OVA	Depth (inches)
0	5N	0-6"	Dk gray silt and clay (marsh grass roots)	NA	
6					

Sediment Sample Log

Project Name: Beazer- Charleston (Barge Canal) **Sample Location:** 5S

Project Number: 472002100 **Sampled by:** JR/NL **Sample Time:** 11:35

Total Depth: 6 inches **Date Started:** 10/22/07 **Date Finished:** 10/22/07

Recovery/Penetration: 6 inches **Water Depth:** 6 inches

Comments: Sample location was within the mash grass.

Description of Sample Location

Depth (inches)	Sample No.	Sample Depth	Sediment Description	OVA	Depth (inches)
0	5S	0-6"	Dk gray silt and clay (marsh grass roots)	NA	
6					

Attachment B

Data Validation/Laboratory Results

Memo

To	**John Rice**	File no	4-7200-2100
From	**Denise Ladebauche**	cc	
Date	**December 12, 2007**		

Subject **Beazer Charleston Data Validation**

INTRODUCTION

Data for the analyses of 11 sediments, including one field duplicate, and one aqueous equipment rinsate have been reviewed. These samples were collected on October 22 and 23, 2007 at the Beazer Charleston Barge Canal site in Charleston, SC. Samples were submitted to TestAmerica Pittsburgh for analyses for PAH, TOC and grain size. The analysis of TOC was completed by TestAmerica Savannah and the grain size analyses were completed by TestAmerica Burlington in Colchester, VT. Data were reviewed in accordance with method requirements and the U.S. EPA National Functional Guidelines for Organic Data Review (10/99).

SUMMARY OF VALIDATION FINDINGS

Results are in general valid as reported. It should be noted that all sediment samples contained less than 50% solids. EPA guidance indicates that organic data for samples with less than 50% solids should be qualified as estimated. The analysis method cannot distinguish between PAH or TOC absorbed in the sediment solids and PAH that are in the aqueous phase of the sample as submitted, so PAH and TOC results reported on a dry weight basis for the sediment are potentially biased high.

Quality assurance/quality control measures met method requirements for PAH, TOC and grain size analyses. All holding times for TOC and PAH were met, the method blanks and the equipment blank did not contain target analytes above the reporting limit, and laboratory spike and matrix spike recoveries were acceptable. All PAH surrogate recoveries were acceptable.

REVIEW ELEMENTS

Data validation included review and evaluation of the following elements:

1. Sampling records
2. Chain of Custody documentation
3. Holding times
4. Instrument tune
5. Instrument initial and continuing calibrations
6. Internal standard areas
7. Method blanks
8. Laboratory spike samples
9. Matrix spike/matrix duplicate samples
10. Surrogate recoveries

11. Field duplicates
12. Laboratory duplicates
13. Equipment blanks

No discrepancies or anomalous results were noted. Field duplicate results for PAHs and TOC are presented below. No PAHs were present above the reporting limit as such agreement within 50% relative difference is not applicable; however data has been presented.

	Concentration, ug/kg				RPD
Analyte	**5S**		**5S Duplicate**		
Fluoranthene	61	J	110	J	57%
Pyrene	64	J	120	J	61%
Benzo(a)anthracene	34	J	60	J	55%
Chrysene	28	J	54	J	63%
Benzo(b)fluoranthene	74	J	110	J	39%
Benzo(k)fluoranthene	28	J	39	J	33%
Benzo(a)pyrene	43	J	57	J	28%
TOC	47000		45000		4%

J = estimated value, measured below reporting limit.

AMEC Earth & Environmental

Client Sample ID: 1S

GC/MS Semivolatiles

Lot-Sample #...:	C7J230246-001	Work Order #...:	J9MHP1AF	Matrix.....:	SOLID
Date Sampled...:	10/22/07 09:45	Date Received..:	10/23/07 09:30	MS Run #.....:	7302069
Prep Date.....:	10/29/07	Analysis Date..:	11/13/07		
Prep Batch #...:	7302105	Analysis Time..:	07:34		
Dilution Factor:	0.5	Initial Wgt/Vol:	30 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:	76	Analyst ID.....:	003200	Instrument ID..:	733
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	140	ug/kg	34
Acenaphthylene	46 J	140	ug/kg	40
Acenaphthene	ND	140	ug/kg	36
Fluorene	ND	140	ug/kg	34
Phenanthrene	73 J	140	ug/kg	33
Anthracene	57 J	140	ug/kg	39
Fluoranthene	300	140	ug/kg	45
Pyrene	460	140	ug/kg	42
Benzo(a)anthracene	170	140	ug/kg	27
Chrysene	210	140	ug/kg	27
Benzo(b)fluoranthene	200	140	ug/kg	27
Benzo(k)fluoranthene	170	140	ug/kg	22
Benzo(a)pyrene	230	140	ug/kg	21
Indeno(1,2,3-cd)pyrene	130 J	140	ug/kg	25
Dibenzo(a,h)anthracene	ND	140	ug/kg	44
Benzo(ghi)perylene	130 J	140	ug/kg	24

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	78	(10 - 117)
2-Fluorobiphenyl	73	(20 - 109)
2-Fluorophenol	73	(10 - 113)
Nitrobenzene-d5	71	(18 - 106)
Phenol-d5	81	(18 - 113)
Terphenyl-d14	88	(10 - 138)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

AMEC Earth & Environmental

Client Sample ID: IN

GC/MS Semivolatiles

Lot-Sample #...:	C7J230246-006	Work Order #...:	J9MJ01AF	Matrix.....:	SOLID
Date Sampled...:	10/22/07 12:30	Date Received..:	10/23/07 09:30	MS Run #.....:	7302069
Prep Date.....:	10/29/07	Analysis Date..:	11/13/07		
Prep Batch #...:	7302105	Analysis Time..:	09:57		
Dilution Factor:	0.5	Initial Wgt/Vol:	30.2 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:	78	Analyst ID.....:	003200	Instrument ID..:	733
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	150	ug/kg	36
Acenaphthylene	ND	150	ug/kg	43
Acenaphthene	ND	150	ug/kg	39
Fluorene	ND	150	ug/kg	36
Phenanthrene	ND	150	ug/kg	36
Anthracene	ND	150	ug/kg	42
Fluoranthene	150	150	ug/kg	48
Pyrene	320	150	ug/kg	46
Benzo(a)anthracene	72 J	150	ug/kg	30
Chrysene	82 J	150	ug/kg	30
Benzo(b)fluoranthene	250	150	ug/kg	29
Benzo(k)fluoranthene	110 J	150	ug/kg	24
Benzo(a)pyrene	150	150	ug/kg	23
Indeno(1,2,3-cd)pyrene	49 J	150	ug/kg	26
Dibenzo(a,h)anthracene	ND	150	ug/kg	47
Benzo(ghi)perylene	ND	150	ug/kg	25

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	74	(10 - 117)
2-Fluorobiphenyl	72	(20 - 109)
2-Fluorophenol	72	(10 - 113)
Nitrobenzene-d5	75	(18 - 106)
Phenol-d5	79	(18 - 113)
Terphenyl-d14	90	(10 - 138)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

AMEC Earth & Environmental

Client Sample ID: 2S

GC/MS Semivolatiles

Lot-Sample #...:	C7J230246-002	Work Order #...:	J9MJM1AF	Matrix.....:	SOLID
Date Sampled...:	10/22/07 10:10	Date Received..:	10/23/07 09:30	MS Run #.....:	7302069
Prep Date.....:	10/29/07	Analysis Date..:	11/13/07		
Prep Batch #...:	7302105	Analysis Time..:	08:03		
Dilution Factor:	0.5	Initial Wgt/Vol:	30.2 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:	75	Analyst ID.....:	003200	Instrument ID..:	733
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	130	ug/kg	32
Acenaphthylene	**56 J**	**130**	**ug/kg**	**39**
Acenaphthene	ND	130	ug/kg	35
Fluorene	ND	130	ug/kg	32
Phenanthrene	**97 J**	**130**	**ug/kg**	**32**
Anthracene	**280**	**130**	**ug/kg**	**38**
Fluoranthene	**410**	**130**	**ug/kg**	**43**
Pyrene	**630**	**130**	**ug/kg**	**41**
Benzo(a)anthracene	**300**	**130**	**ug/kg**	**26**
Chrysene	**620**	**130**	**ug/kg**	**26**
Benzo(b)fluoranthene	**770**	**130**	**ug/kg**	**26**
Benzo(k)fluoranthene	ND	130	ug/kg	21
Benzo(a)pyrene	**360**	**130**	**ug/kg**	**21**
Indeno(1,2,3-cd)pyrene	**140**	**130**	**ug/kg**	**24**
Dibenzo(a,h)anthracene	**45 J**	**130**	**ug/kg**	**42**
Benzo(ghi)perylene	**180**	**130**	**ug/kg**	**23**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	68	(10 - 117)
2-Fluorobiphenyl	69	(20 - 109)
2-Fluorophenol	70	(10 - 113)
Nitrobenzene-d5	73	(18 - 106)
Phenol-d5	81	(18 - 113)
Terphenyl-d14	86	(10 - 138)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

AMEC Earth & Environmental

Client Sample ID: 2N

GC/MS Semivolatiles

Lot-Sample #...:	C7J230246-007	Work Order #...:	J9MJ41AF	Matrix.....:	SOLID
Date Sampled...:	10/22/07 12:45	Date Received..:	10/23/07 09:30	MS Run #.....:	7302069
Prep Date.....:	10/29/07	Analysis Date..:	11/13/07		
Prep Batch #...:	7302105	Analysis Time..:	10:26		
Dilution Factor:	0.5	Initial Wgt/Vol:	30 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:	72	Analyst ID.....:	003200	Instrument ID..:	733
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	120	ug/kg	29
Acenaphthylene	**35 J**	**120**	**ug/kg**	**35**
Acenaphthene	ND	120	ug/kg	31
Fluorene	ND	120	ug/kg	29
Phenanthrene	**50 J**	**120**	**ug/kg**	**29**
Anthracene	**58 J**	**120**	**ug/kg**	**34**
Fluoranthene	**220**	**120**	**ug/kg**	**39**
Pyrene	**520**	**120**	**ug/kg**	**37**
Benzo(a)anthracene	**110 J**	**120**	**ug/kg**	**24**
Chrysene	**140**	**120**	**ug/kg**	**24**
Benzo(b)fluoranthene	**310**	**120**	**ug/kg**	**23**
Benzo(k)fluoranthene	**160**	**120**	**ug/kg**	**19**
Benzo(a)pyrene	**180**	**120**	**ug/kg**	**19**
Indeno(1,2,3-cd)pyrene	**110 J**	**120**	**ug/kg**	**21**
Dibenzo(a,h)anthracene	ND	120	ug/kg	38
Benzo(ghi)perylene	**130**	**120**	**ug/kg**	**20**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	84	(10 - 117)
2-Fluorobiphenyl	72	(20 - 109)
2-Fluorophenol	73	(10 - 113)
Nitrobenzene-d5	75	(18 - 106)
Phenol-d5	85	(18 - 113)
Terphenyl-d14	90	(10 - 138)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

AMEC Earth & Environmental

Client Sample ID: 3S

GC/MS Semivolatiles

Lot-Sample #...:	C7J230246-003	Work Order #...:	J9MJQ1AF	Matrix.....:	SOLID
Date Sampled...:	10/22/07 10:30	Date Received..:	10/23/07 09:30	MS Run #.....:	7302069
Prep Date.....:	10/29/07	Analysis Date..:	11/13/07		
Prep Batch #...:	7302105	Analysis Time..:	08:31		
Dilution Factor:	0.5	Initial Wgt/Vol:	30 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:	77	Analyst ID.....:	003200	Instrument ID..:	733
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	140	ug/kg	34
Acenaphthylene	75 J	140	ug/kg	41
Acenaphthene	ND	140	ug/kg	37
Fluorene	ND	140	ug/kg	34
Phenanthrene	99 J	140	ug/kg	34
Anthracene	180	140	ug/kg	40
Fluoranthene	330	140	ug/kg	46
Pyrene	680	140	ug/kg	43
Benzo(a)anthracene	300	140	ug/kg	28
Chrysene	670	140	ug/kg	28
Benzo(b)fluoranthene	820	140	ug/kg	27
Benzo(k)fluoranthene	310	140	ug/kg	23
Benzo(a)pyrene	430	140	ug/kg	22
Indeno(1,2,3-cd)pyrene	240	140	ug/kg	25
Dibenzo(a,h)anthracene	45 J	140	ug/kg	45
Benzo(ghi)perylene	230	140	ug/kg	24

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	73	(10 - 117)
2-Fluorobiphenyl	66	(20 - 109)
2-Fluorophenol	72	(10 - 113)
Nitrobenzene-d5	72	(18 - 106)
Phenol-d5	81	(18 - 113)
Terphenyl-d14	85	(10 - 138)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

AMEC Earth & Environmental

Client Sample ID: 3N

GC/MS Semivolatiles

Lot-Sample #...:	C7J240208-001	Work Order #...:	J9PND1AM	Matrix.....:	SOLID
Date Sampled...:	10/23/07 10:15	Date Received..:	10/24/07 09:20	MS Run #.....:	7302069
Prep Date.....:	10/29/07	Analysis Date..:	11/13/07		
Prep Batch #...:	7302105	Analysis Time..:	05:11		
Dilution Factor:	0.5	Initial Wgt/Vol:	30 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:	75	Analyst ID.....:	003200	Instrument ID..:	733
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	**33 J**	**130**	**ug/kg**	**32**
Acenaphthylene	**130**	**130**	**ug/kg**	**39**
Acenaphthene	ND	130	ug/kg	35
Fluorene	ND	130	ug/kg	32
Phenanthrene	**87 J**	**130**	**ug/kg**	**32**
Anthracene	**200**	**130**	**ug/kg**	**38**
Fluoranthene	**470**	**130**	**ug/kg**	**43**
Pyrene	**900**	**130**	**ug/kg**	**41**
Benzo(a)anthracene	**350**	**130**	**ug/kg**	**26**
Chrysene	**660**	**130**	**ug/kg**	**26**
Benzo(b)fluoranthene	**1100**	**130**	**ug/kg**	**26**
Benzo(k)fluoranthene	**350**	**130**	**ug/kg**	**21**
Benzo(a)pyrene	**600**	**130**	**ug/kg**	**21**
Indeno(1,2,3-cd)pyrene	**200**	**130**	**ug/kg**	**24**
Dibenzo(a,h)anthracene	**100 J**	**130**	**ug/kg**	**42**
Benzo(ghi)perylene	**410**	**130**	**ug/kg**	**23**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	72	(10 - 117)
2-Fluorobiphenyl	65	(20 - 109)
2-Fluorophenol	63	(10 - 113)
Nitrobenzene-d5	65	(18 - 106)
Phenol-d5	68	(18 - 113)
Terphenyl-d14	76	(10 - 138)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

AMEC Earth & Environmental

Client Sample ID: 4S

GC/MS Semivolatiles

Lot-Sample #...:	C7J230246-004	Work Order #...:	J9MJT1AF	Matrix.....:	SOLID
Date Sampled...:	10/22/07 11:05	Date Received..:	10/23/07 09:30	MS Run #.....:	7302069
Prep Date.....:	10/29/07	Analysis Date..:	11/13/07		
Prep Batch #...:	7302105	Analysis Time..:	09:00		
Dilution Factor:	0.5	Initial Wgt/Vol:	30 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:	77	Analyst ID.....:	003200	Instrument ID..:	733
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	140	ug/kg	34
Acenaphthylene	ND	140	ug/kg	41
Acenaphthene	ND	140	ug/kg	37
Fluorene	ND	140	ug/kg	34
Phenanthrene	36 J	140	ug/kg	34
Anthracene	59 J	140	ug/kg	40
Fluoranthene	140	140	ug/kg	46
Pyrene	220	140	ug/kg	43
Benzo(a)anthracene	110 J	140	ug/kg	28
Chrysene	250	140	ug/kg	28
Benzo(b)fluoranthene	240	140	ug/kg	27
Benzo(k)fluoranthene	100 J	140	ug/kg	23
Benzo(a)pyrene	140	140	ug/kg	22
Indeno(1,2,3-cd)pyrene	58 J	140	ug/kg	25
Dibenzo(a,h)anthracene	ND	140	ug/kg	45
Benzo(ghi)perylene	73 J	140	ug/kg	24

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	77	(10 - 117)
2-Fluorobiphenyl	69	(20 - 109)
2-Fluorophenol	71	(10 - 113)
Nitrobenzene-d5	71	(18 - 106)
Phenol-d5	81	(18 - 113)
Terphenyl-d14	92	(10 - 138)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

AMEC Earth & Environmental

Client Sample ID: 4N

GC/MS Semivolatiles

Lot-Sample #...:	C7J240208-002	Work Order #...:	J9PNF1AF	Matrix.....:	SOLID
Date Sampled...:	10/23/07 10:50	Date Received..:	10/24/07 09:20	MS Run #.....:	7302069
Prep Date.....:	10/29/07	Analysis Date..:	11/13/07		
Prep Batch #...:	7302105	Analysis Time..:	06:37		
Dilution Factor:	0.5	Initial Wgt/Vol:	30 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....:	74	Analyst ID.....:	003200	Instrument ID..:	733
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	130	ug/kg	31
Acenaphthylene	ND	130	ug/kg	38
Acenaphthene	ND	130	ug/kg	34
Fluorene	ND	130	ug/kg	31
Phenanthrene	ND	130	ug/kg	31
Anthracene	**40 J**	**130**	**ug/kg**	**37**
Fluoranthene	**130**	**130**	**ug/kg**	**42**
Pyrene	**210**	**130**	**ug/kg**	**39**
Benzo(a)anthracene	**82 J**	**130**	**ug/kg**	**26**
Chrysene	**140**	**130**	**ug/kg**	**26**
Benzo(b)fluoranthene	**260**	**130**	**ug/kg**	**25**
Benzo(k)fluoranthene	**57 J**	**130**	**ug/kg**	**21**
Benzo(a)pyrene	**130**	**130**	**ug/kg**	**20**
Indeno(1,2,3-cd)pyrene	ND	130	ug/kg	23
Dibenzo(a,h)anthracene	ND	130	ug/kg	41
Benzo(ghi)perylene	**73 J**	**130**	**ug/kg**	**22**

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	79	(10 - 117)
2-Fluorobiphenyl	72	(20 - 109)
2-Fluorophenol	76	(10 - 113)
Nitrobenzene-d5	78	(18 - 106)
Phenol-d5	87	(18 - 113)
Terphenyl-d14	92	(10 - 138)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

AMEC Earth & Environmental

Client Sample ID: 5S

GC/MS Semivolatiles

Lot-Sample #...:	C7J230246-005	**Work Order #...:**	J9MJW1AF	**Matrix.....:**	SOLID
Date Sampled...:	10/22/07 11:35	**Date Received..:**	10/23/07 09:30	**MS Run #.....:**	7302069
Prep Date.....:	10/29/07	**Analysis Date..:**	11/13/07		
Prep Batch #...:	7302105	**Analysis Time..:**	09:29		
Dilution Factor:	0.5	**Initial Wgt/Vol:**	30 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	76	**Analyst ID.....:**	003200	**Instrument ID..:**	733
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	140	ug/kg	34
Acenaphthylene	ND	140	ug/kg	41
Acenaphthene	ND	140	ug/kg	37
Fluorene	ND	140	ug/kg	34
Phenanthrene	ND	140	ug/kg	34
Anthracene	ND	140	ug/kg	40
Fluoranthene	**61 J**	**140**	**ug/kg**	**45**
Pyrene	**64 J**	**140**	**ug/kg**	**43**
Benzo(a)anthracene	**34 J**	**140**	**ug/kg**	**28**
Chrysene	**28 J**	**140**	**ug/kg**	**28**
Benzo(b)fluoranthene	**74 J**	**140**	**ug/kg**	**27**
Benzo(k)fluoranthene	**28 J**	**140**	**ug/kg**	**23**
Benzo(a)pyrene	**43 J**	**140**	**ug/kg**	**22**
Indeno(1,2,3-cd)pyrene	ND	140	ug/kg	25
Dibenzo(a,h)anthracene	ND	140	ug/kg	45
Benzo(ghi)perylene	ND	140	ug/kg	24

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	72	(10 - 117)
2-Fluorobiphenyl	65	(20 - 109)
2-Fluorophenol	68	(10 - 113)
Nitrobenzene-d5	69	(18 - 106)
Phenol-d5	80	(18 - 113)
Terphenyl-d14	85	(10 - 138)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

AMEC Earth & Environmental

Client Sample ID: 5N

GC/MS Semivolatiles

Lot-Sample #...:	C7J240208-003	**Work Order #...:**	J9PNH1AF	**Matrix.....:**	SOLID
Date Sampled...:	10/23/07 11:15	**Date Received..:**	10/24/07 09:20	**MS Run #.....:**	7302069
Prep Date.....:	10/29/07	**Analysis Date..:**	11/13/07		
Prep Batch #...:	7302105	**Analysis Time..:**	07:05		
Dilution Factor:	0.5	**Initial Wgt/Vol:**	30 g	**Final Wgt/Vol..:**	0.5 mL
% Moisture.....:	75	**Analyst ID.....:**	003200	**Instrument ID..:**	733
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	140	ug/kg	33
Acenaphthylene	ND	140	ug/kg	39
Acenaphthene	ND	140	ug/kg	35
Fluorene	ND	140	ug/kg	33
Phenanthrene	ND	140	ug/kg	32
Anthracene	**64 J**	**140**	**ug/kg**	**38**
Fluoranthene	**110 J**	**140**	**ug/kg**	**43**
Pyrene	**160**	**140**	**ug/kg**	**41**
Benzo(a)anthracene	**84 J**	**140**	**ug/kg**	**27**
Chrysene	**210**	**140**	**ug/kg**	**27**
Benzo(b)fluoranthene	**190**	**140**	**ug/kg**	**26**
Benzo(k)fluoranthene	**90 J**	**140**	**ug/kg**	**22**
Benzo(a)pyrene	**120 J**	**140**	**ug/kg**	**21**
Indeno(1,2,3-cd)pyrene	**27 J**	**140**	**ug/kg**	**24**
Dibenzo(a,h)anthracene	ND	140	ug/kg	43
Benzo(ghi)perylene	ND	140	ug/kg	23

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	77	(10 - 117)
2-Fluorobiphenyl	74	(20 - 109)
2-Fluorophenol	72	(10 - 113)
Nitrobenzene-d5	77	(18 - 106)
Phenol-d5	85	(18 - 113)
Terphenyl-d14	89	(10 - 138)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

AMEC Earth & Environmental

Client Sample ID: FIELD DUP

GC/MS Semivolatiles

Lot-Sample #...: C7J230246-008	Work Order #...: J9MJ91AF	Matrix.....:	SOLID
Date Sampled...: 10/22/07	Date Received..: 10/23/07 09:30	MS Run #.....:	7302069
Prep Date.....: 10/29/07	Analysis Date..: 11/13/07		
Prep Batch #...: 7302105	Analysis Time..: 10:55		
Dilution Factor: 0.5	Initial Wgt/Vol: 30 g	Final Wgt/Vol..:	0.5 mL
% Moisture.....: 77	Analyst ID.....: 003200	Instrument ID..:	733
	Method.....: SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	150	ug/kg	36
Acenaphthylene	ND	150	ug/kg	43
Acenaphthene	ND	150	ug/kg	38
Fluorene	ND	150	ug/kg	36
Phenanthrene	ND	150	ug/kg	35
Anthracene	ND	150	ug/kg	42
Fluoranthene	**110 J**	**150**	**ug/kg**	**48**
Pyrene	**120 J**	**150**	**ug/kg**	**45**
Benzo(a)anthracene	**60 J**	**150**	**ug/kg**	**29**
Chrysene	**54 J**	**150**	**ug/kg**	**29**
Benzo(b)fluoranthene	**110 J**	**150**	**ug/kg**	**28**
Benzo(k)fluoranthene	**39 J**	**150**	**ug/kg**	**24**
Benzo(a)pyrene	**57 J**	**150**	**ug/kg**	**23**
Indeno(1,2,3-cd)pyrene	ND	150	ug/kg	26
Dibenzo(a,h)anthracene	ND	150	ug/kg	47
Benzo(ghi)perylene	ND	150	ug/kg	25

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	69	(10 - 117)
2-Fluorobiphenyl	66	(20 - 109)
2-Fluorophenol	66	(10 - 113)
Nitrobenzene-d5	70	(18 - 106)
Phenol-d5	75	(18 - 113)
Terphenyl-d14	88	(10 - 138)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than RL.

AMEC Earth & Environmental

Client Sample ID: RINSATE

GC/MS Semivolatiles

Lot-Sample #...:	C7J230246-009	**Work Order #...:**	J9MKA1AC	**Matrix.....:**	WATER
Date Sampled...:	10/22/07 13:45	**Date Received..:**	10/23/07 09:30	**MS Run #.....:**	7298159
Prep Date.....:	10/25/07	**Analysis Date..:**	11/09/07		
Prep Batch #...:	7298239	**Analysis Time..:**	06:31		
Dilution Factor:	0.97	**Initial Wgt/Vol:**	1030 mL	**Final Wgt/Vol..:**	1 mL
Analyst ID.....:	003200	**Instrument ID..:**	733		
		Method.....:	SW846 8270C		

PARAMETER	RESULT	REPORTING LIMIT	UNITS	MDL
Naphthalene	ND	9.7	ug/L	0.42
Acenaphthylene	ND	9.7	ug/L	0.45
Acenaphthene	ND	9.7	ug/L	0.51
Fluorene	ND	9.7	ug/L	0.53
Phenanthrene	ND	9.7	ug/L	0.53
Anthracene	ND	9.7	ug/L	0.49
Fluoranthene	ND	9.7	ug/L	0.48
Pyrene	ND	9.7	ug/L	0.55
Benzo(a)anthracene	ND	9.7	ug/L	0.40
Chrysene	ND	9.7	ug/L	0.34
Benzo(b)fluoranthene	ND	9.7	ug/L	0.30
Benzo(k)fluoranthene	ND	9.7	ug/L	0.38
Benzo(a)pyrene	ND	9.7	ug/L	0.42
Indeno(1,2,3-cd)pyrene	ND	9.7	ug/L	0.46
Dibenzo(a,h)anthracene	ND	9.7	ug/L	0.34
Benzo(ghi)perylene	ND	9.7	ug/L	0.27

SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
2,4,6-Tribromophenol	62	(20 - 107)
2-Fluorobiphenyl	60	(27 - 104)
2-Fluorophenol	64	(17 - 102)
Nitrobenzene-d5	63	(33 - 103)
Phenol-d5	71	(25 - 107)
Terphenyl-d14	76	(14 - 127)

General Chemistry

Client Sample ID: 1S

Lab Sample ID: 680-31325-1 Date Sampled: 10/22/2007 0000
Client Matrix: Solid Date Received: 10/24/2007 1030

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Total Organic Carbon	37000		mg/Kg	500	1000	1.0	9060

Anly Batch: 680-89825 Date Analyzed 10/31/2007 1143 DryWt Corrected: N

Client Sample ID: 2S

Lab Sample ID: 680-31325-2 Date Sampled: 10/22/2007 0000
Client Matrix: Solid Date Received: 10/24/2007 1030

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Total Organic Carbon	35000		mg/Kg	500	1000	1.0	9060

Anly Batch: 680-89825 Date Analyzed 10/31/2007 1143 DryWt Corrected: N

Client Sample ID: 3S

Lab Sample ID: 680-31325-3 Date Sampled: 10/22/2007 0000
Client Matrix: Solid Date Received: 10/24/2007 1030

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Total Organic Carbon	40000		mg/Kg	500	1000	1.0	9060

Anly Batch: 680-89825 Date Analyzed 10/31/2007 1143 DryWt Corrected: N

Client Sample ID: 4S

Lab Sample ID: 680-31325-4 Date Sampled: 10/22/2007 0000
Client Matrix: Solid Date Received: 10/24/2007 1030

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Total Organic Carbon	39000		mg/Kg	500	1000	1.0	9060

Anly Batch: 680-89825 Date Analyzed 10/31/2007 1143 DryWt Corrected: N

Client Sample ID: 5S

Lab Sample ID: 680-31325-5 Date Sampled: 10/22/2007 0000
Client Matrix: Solid Date Received: 10/24/2007 1030

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Total Organic Carbon	47000		mg/Kg	500	1000	1.0	9060

Anly Batch: 680-89825 Date Analyzed 10/31/2007 1143 DryWt Corrected: N

General Chemistry

Client Sample ID: 1N

Lab Sample ID: 680-31325-6 Date Sampled: 10/22/2007 0000
Client Matrix: Solid Date Received: 10/24/2007 1030

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Total Organic Carbon	35000		mg/Kg	500	1000	1.0	9060
	Anly Batch: 680-89825	Date Analyzed	10/31/2007 1143			DryWt Corrected: N	

Client Sample ID: 2N

Lab Sample ID: 680-31325-7 Date Sampled: 10/22/2007 0000
Client Matrix: Solid Date Received: 10/24/2007 1030

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Total Organic Carbon	33000		mg/Kg	500	1000	1.0	9060
	Anly Batch: 680-89825	Date Analyzed	10/31/2007 1143			DryWt Corrected: N	

Client Sample ID: FIELD DUP

Lab Sample ID: 680-31325-8FD Date Sampled: 10/22/2007 0000
Client Matrix: Solid Date Received: 10/24/2007 1030

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Total Organic Carbon	45000		mg/Kg	500	1000	1.0	9060
	Anly Batch: 680-89825	Date Analyzed	10/31/2007 1143			DryWt Corrected: N	

Client Sample ID: RINSATE

Lab Sample ID: 680-31325-9RB Date Sampled: 10/22/2007 0000
Client Matrix: Water Date Received: 10/24/2007 1030

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Total Organic Carbon	0.50	U	mg/L	0.50	1.0	1.0	9060
	Anly Batch: 680-89888	Date Analyzed	11/01/2007 1345				

General Chemistry

Client Sample ID: 3N

Lab Sample ID: 680-31358-1 Date Sampled: 10/23/2007 0000
Client Matrix: Solid Date Received: 10/25/2007 1020

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Total Organic Carbon	41000		mg/Kg	500	1000	1.0	9060

Anly Batch: 680-89825 Date Analyzed 10/31/2007 1143 DryWt Corrected: N

Client Sample ID: 4N

Lab Sample ID: 680-31358-2 Date Sampled: 10/23/2007 0000
Client Matrix: Solid Date Received: 10/25/2007 1020

Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Total Organic Carbon	40000		mg/Kg	500	1000	1.0	9060

Anly Batch: 680-89825 Date Analyzed 10/31/2007 1143 DryWt Corrected: N

Client Sample ID: 5N

Lab Sample ID: 680-31358-3 Date Sampled: 10/23/2007 0000
Client Matrix: Solid Date Received: 10/25/2007 1020

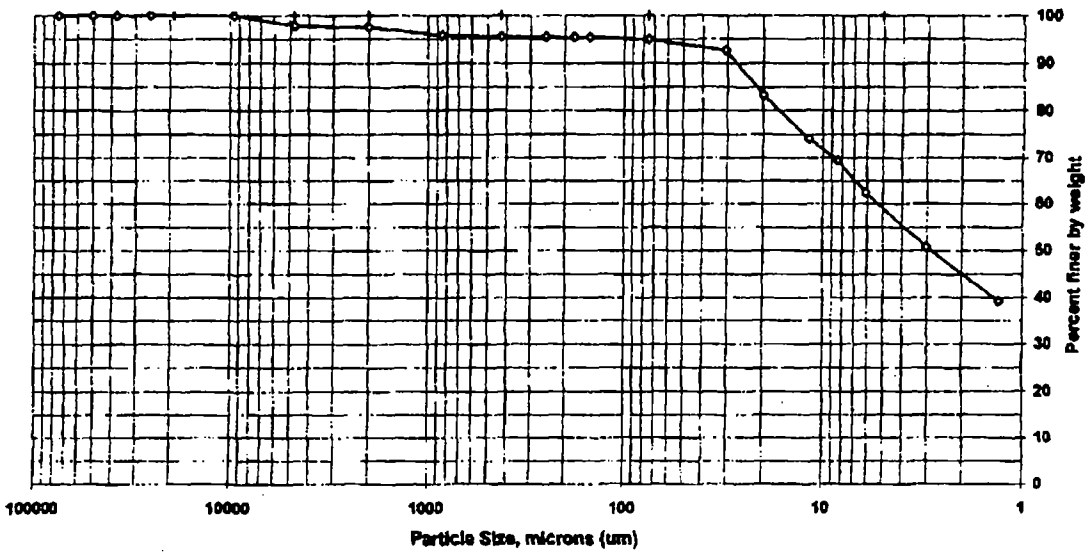
Analyte	Result	Qual	Units	MDL	RL	Dil	Method
Total Organic Carbon	44000		mg/Kg	500	1000	1.0	9060

Anly Batch: 680-89825 Date Analyzed 10/31/2007 1143 DryWt Corrected: N

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7J230246	Date Received:	10/24/2007
Sample ID:	1S	ETR(s):	122645	Start Date:	11/19/2007
Lab ID:	729683			End Date:	11/28/2007

Percent Solids:	25.3%	Non-soil material:	shell, plant
Specific Gravity:	2.650	Shape (> #10):	n/a
Maximum Particle Size:	9.5 mm	Hardness (> #10):	n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	97.8	2.2
#10	2000	97.5	0.3
#20	850	95.7	1.8
#40	425	95.6	0.1
#60	250	95.5	0.1
#80	180	95.4	0.1
#100	150	95.4	0.0
#200	75	95.0	0.4
Hydrometer	30.6	92.7	2.3
	19.9	83.4	9.3
	11.8	74.1	9.3
	8.4	69.4	4.7
	6.1	62.4	7.0
	3.0	50.8	11.6
V	1.3	39.2	11.6

Soil Classification	Percent of Total Sample
Gravel	2.2
Sand	2.8
Coarse Sand	0.3
Medium Sand	2.0
Fine Sand	0.6
Silt	32.5
Clay	62.4

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

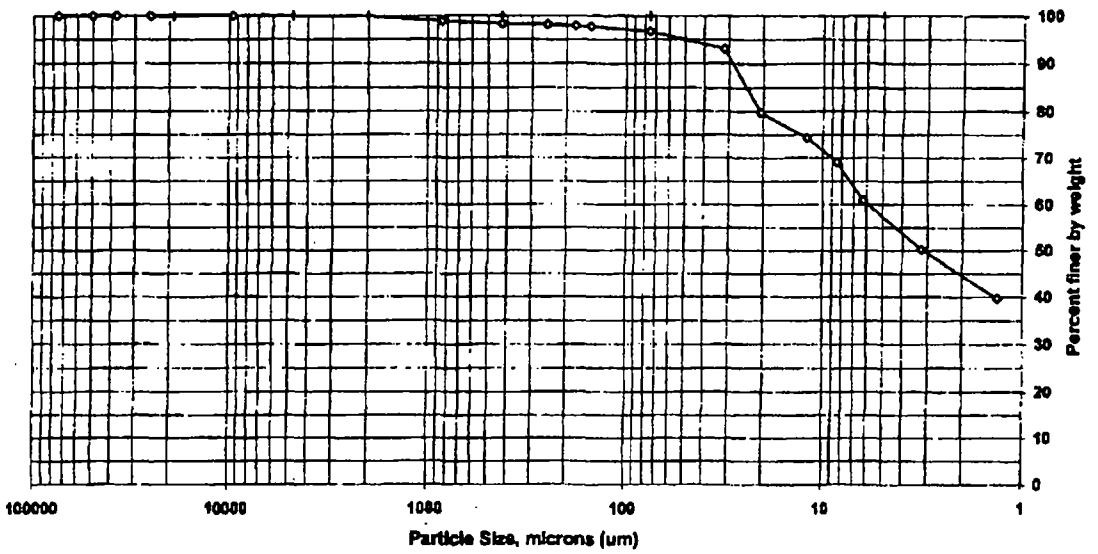
FSL024:07.29.05:0
STL Burlington

7J230246PS 11/29/2007

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7J230246	Date Received:	10/24/2007
Sample ID:	1N	ETR(s):	122645	Start Date:	11/19/2007
Lab ID:	729688			End Date:	11/28/2007

Percent Solids:	23.6%	Non-soil material:	plant
Specific Gravity:	2.650	Shape (> #10):	n/a
Maximum Particle Size:	Crs sand	Hardness (> #10):	n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	99.9	0.1
#20	850	99.0	0.9
#40	425	98.4	0.6
#60	250	98.2	0.2
#80	180	97.9	0.3
#100	150	97.8	0.1
#200	75	96.7	1.1
Hydrometer	31.6	93.1	3.6
I	20.8	79.7	13.4
I	12.0	74.4	5.3
I	8.5	69.0	5.3
I	6.2	61.0	8.0
I	3.2	50.3	10.7
V	1.3	39.6	10.7

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	3.3
Coarse Sand	0.1
Medium Sand	1.5
Fine Sand	1.7
Silt	35.7
Clay	61.0

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

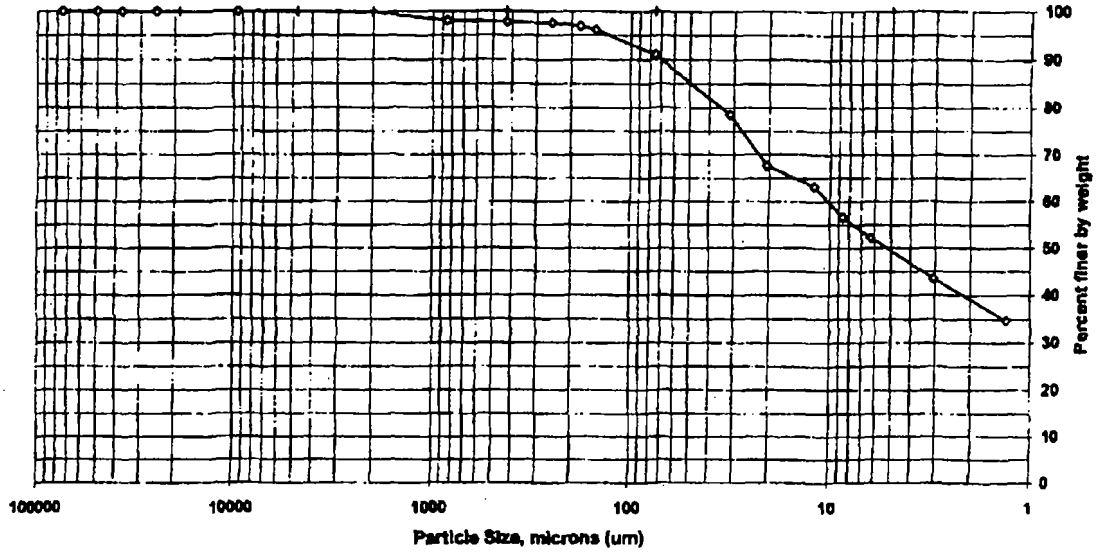
FSL024:07.29.05:0
STL Burlington

7J230246PS 11/29/2007

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7J230246	Date Received:	10/24/2007
Sample ID:	2S	ETR(s):	122645	Start Date:	11/19/2007
Lab ID:	729884			End Date:	11/28/2007

Percent Solids:	29.1%	Non-soil material:	shell, plant
Specific Gravity:	2.650	Shape (> #10):	n/a
Maximum Particle Size:	Crs sand	Hardness (> #10):	n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	99.9	0.1
#20	850	98.1	1.8
#40	425	97.8	0.3
#60	250	97.6	0.2
#80	180	96.9	0.7
#100	150	96.2	0.8
#200	75	91.0	5.2
Hydrometer	31.4	78.6	12.4
I	20.5	67.6	11.0
I	12.0	63.2	4.4
I	8.6	56.7	6.6
I	6.3	52.3	4.4
I	3.0	43.5	8.8
V	1.3	34.7	8.8

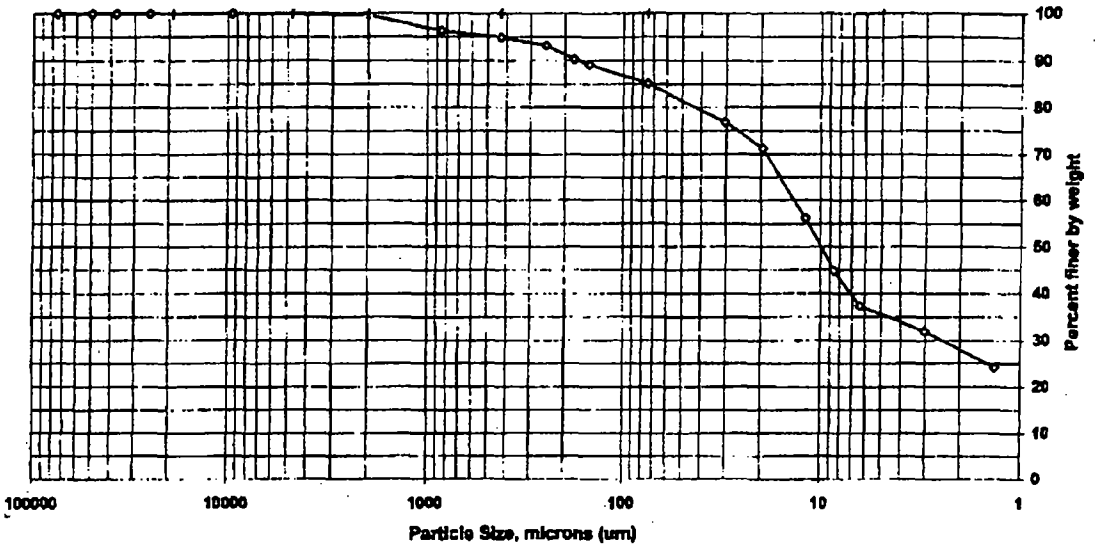
Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	9.0
Coarse Sand	0.1
Medium Sand	2.1
Fine Sand	6.8
Silt	38.7
Clay	52.3

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7J230246	Date Received:	10/24/2007
Sample ID:	2N	ETR(s):	122645	Start Date:	11/19/2007
Lab ID:	729689			End Date:	11/28/2007

Percent Solids:	30.7%	Non-soil material:	plant, shell
Specific Gravity:	2.650	Shape (> #10):	n/a
Maximum Particle Size:	9.5 mm	Hardness (> #10):	n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	99.9	0.1
#10	2000	99.7	0.2
#20	850	96.2	3.5
#40	425	94.9	1.4
#60	250	93.2	1.7
#80	180	90.3	2.9
#100	150	89.1	1.1
#200	75	85.2	3.9
Hydrometer	30.4	76.9	8.3
	19.6	71.2	5.6
	11.9	56.2	15.1
	8.6	44.9	11.3
	6.3	37.3	7.5
	3.0	32.0	5.3
V	1.3	24.2	7.8

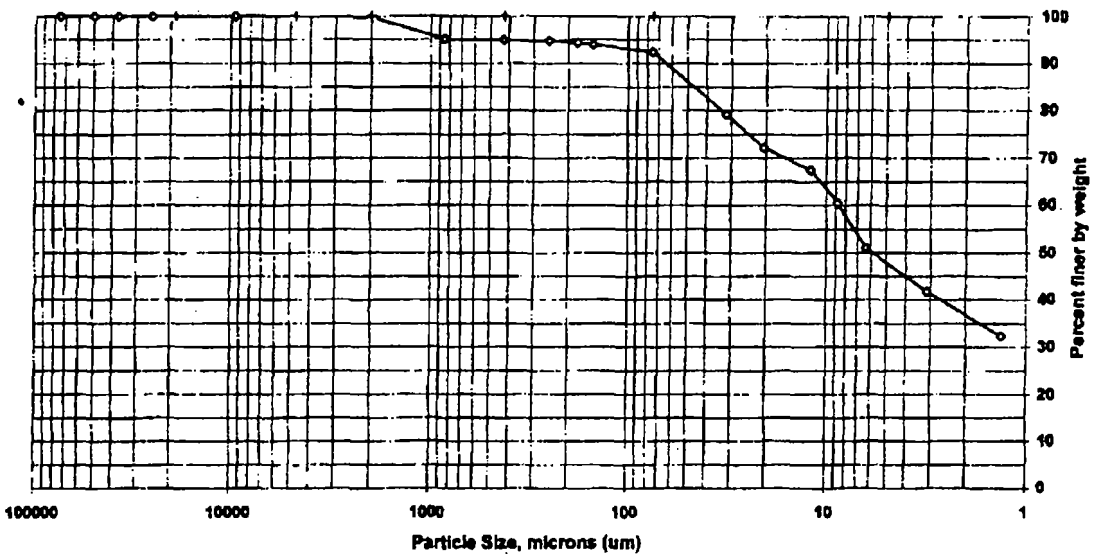
Soil Classification	Percent of Total Sample
Gravel	0.1
Sand	14.7
Coarse Sand	0.2
Medium Sand	4.8
Fine Sand	9.7
Silt	47.8
Clay	37.3

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7J230246	Date Received:	10/24/2007
Sample ID:	3S	ETR(s):	122645	Start Date:	11/19/2007
Lab ID:	729685			End Date:	11/28/2007

Percent Solids:	26.1%	Non-soil material:	shell, plant
Specific Gravity:	2.650	Shape (> #10):	n/a
Maximum Particle Size:	Cre sand	Hardness (> #10):	n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	99.7	0.3
#20	850	95.1	4.7
#40	425	94.9	0.2
#60	250	94.7	0.2
#80	180	94.3	0.4
#100	150	93.9	0.3
#200	75	92.3	1.6
Hydrometer	31.8	79.2	13.1
I	20.5	72.2	7.0
I	12.0	67.5	4.7
I	8.8	60.5	7.0
I	6.3	51.1	9.4
I	3.1	41.7	9.4
V	1.3	32.4	9.4

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	7.7
Coarse Sand	0.3
Medium Sand	4.9
Fine Sand	2.6
Silt	41.2
Clay	51.1

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

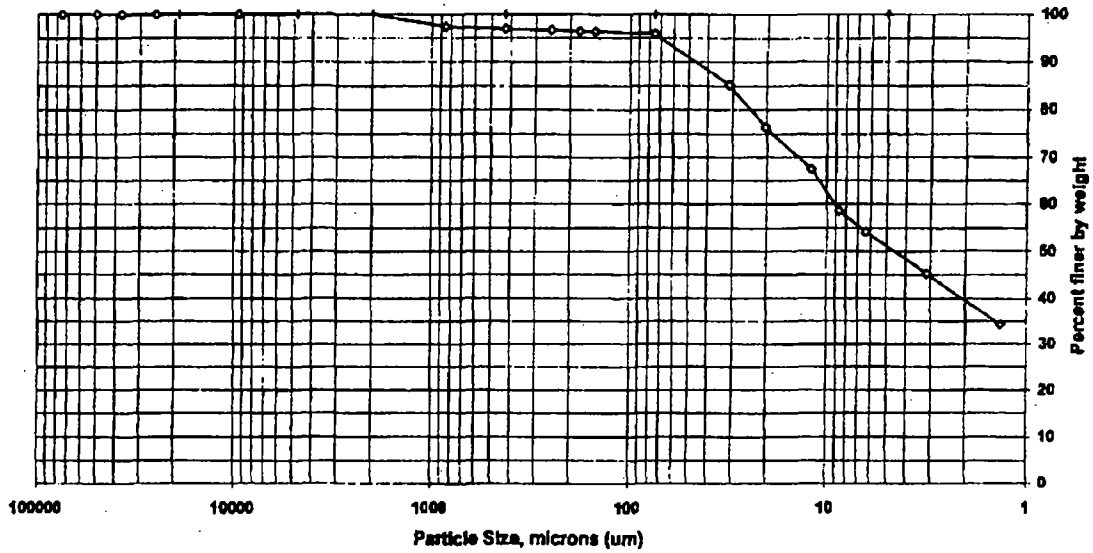
FSL024:07.29.05:0
STL Burlington

7J230246PS 11/29/2007

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7J240208	Date Received:	10/25/2007
Sample ID:	3N	ETR(s):	122644	Start Date:	11/13/2007
Lab ID:	729880			End Date:	11/21/2007

Percent Solids:	27.7%	Non-soil material:	plant
Specific Gravity:	2.650	Shape (> #10):	n/a
Maximum Particle Size:	C/s sand	Hardness (> #10):	n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	99.9	0.1
#20	850	97.4	2.6
#40	425	96.9	0.5
#60	250	96.6	0.2
#80	180	96.4	0.2
#100	150	96.3	0.1
#200	75	95.9	0.5
Hydrometer	31.2	85.2	10.7
|	20.3	76.3	8.9
|	12.0	67.5	8.9
|	8.7	58.6	8.9
|	6.4	54.1	4.4
|	3.1	45.3	8.9
V	1.3	34.2	11.1

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	4.1
Coarse Sand	0.1
Medium Sand	3.1
Fine Sand	1.0
Silt	41.7
Clay	54.1

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

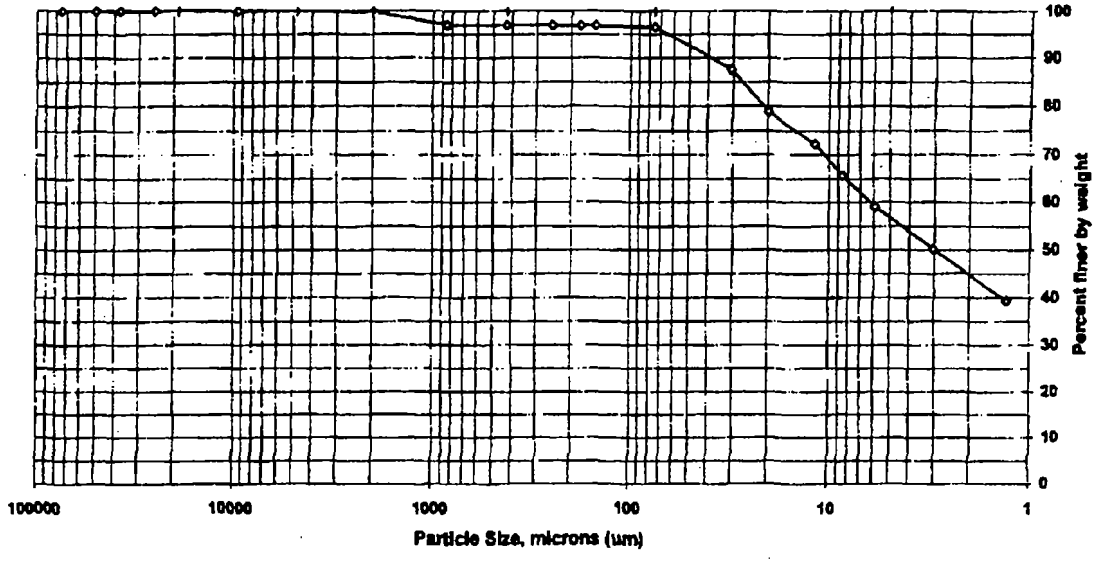
FSL024:07.29.05:0
STL Burlington

7J240208PS 11/21/2007

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	**SDG:**	7J230246	**Date Received:**	10/24/2007
Sample ID:	4S	**ETR(s):**	122645	**Start Date:**	11/19/2007
Lab ID:	729686			**End Date:**	11/28/2007

Percent Solids:	26.7%	**Non-soil material:**	plant
Specific Gravity:	2.650	**Shape (> #10):**	n/a
Maximum Particle Size:	Crs sand	**Hardness (> #10):**	n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	99.8	0.2
#20	850	97.1	2.8
#40	425	97.0	0.1
#60	250	96.9	0.1
#80	180	96.9	0.0
#100	150	96.9	0.0
#200	75	96.6	0.3
Hydrometer	30.6	87.6	8.9
|	19.9	78.8	8.8
|	11.7	72.2	6.6
|	8.6	65.6	6.6
|	5.9	59.0	6.6
|	3.0	50.2	8.8
V	1.3	39.2	11.0

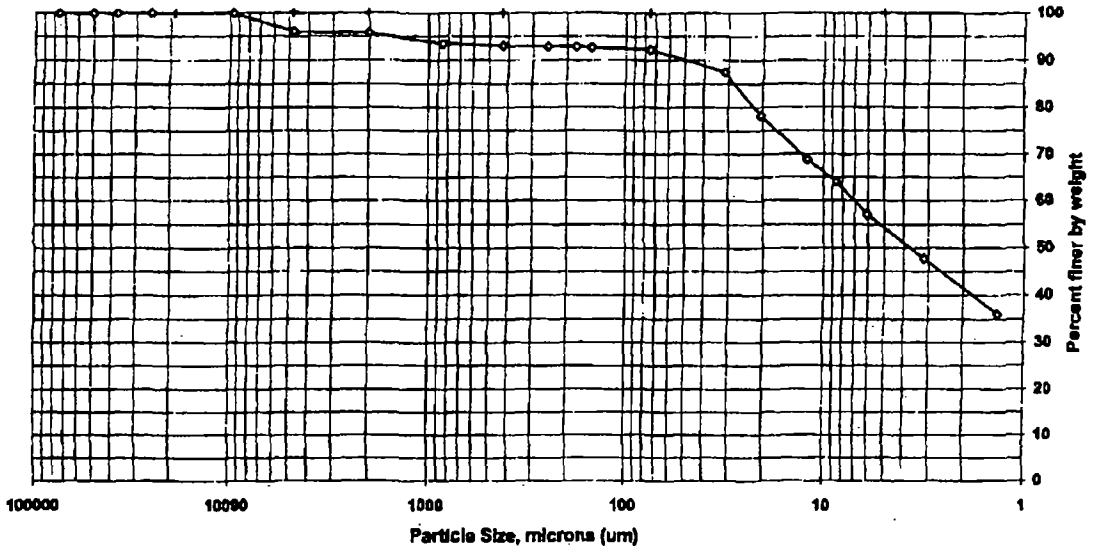
Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	3.4
Coarse Sand	0.2
Medium Sand	2.8
Fine Sand	0.4
Silt	37.5
Clay	59.0

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	**SDG:**	7J240208	**Date Received:**	10/25/2007
Sample ID:	4N	**ETR(s):**	122644	**Start Date:**	11/13/2007
Lab ID:	729681			**End Date:**	11/21/2007

Percent Solids:	25.1%	**Non-soil material:**	plant, shell
Specific Gravity:	2.650	**Shape (> #10):**	n/a
Maximum Particle Size:	9.5 mm	**Hardness (> #10):**	n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	95.9	4.1
#10	2000	95.7	0.2
#20	850	93.5	2.2
#40	425	93.0	0.5
#60	250	92.8	0.2
#80	180	92.8	0.1
#100	150	92.7	0.1
#200	75	92.3	0.4
Hydrometer	31.4	87.5	4.7
|	20.4	78.2	9.4
|	12.0	68.8	9.4
|	8.6	64.1	4.7
|	6.0	57.1	7.0
|	3.2	47.7	9.4
V	1.3	36.1	11.7

Soil Classification	Percent of Total Sample
Gravel	4.1
Sand	3.7
Coarse Sand	0.2
Medium Sand	2.7
Fine Sand	0.8
Silt	35.2
Clay	57.1

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

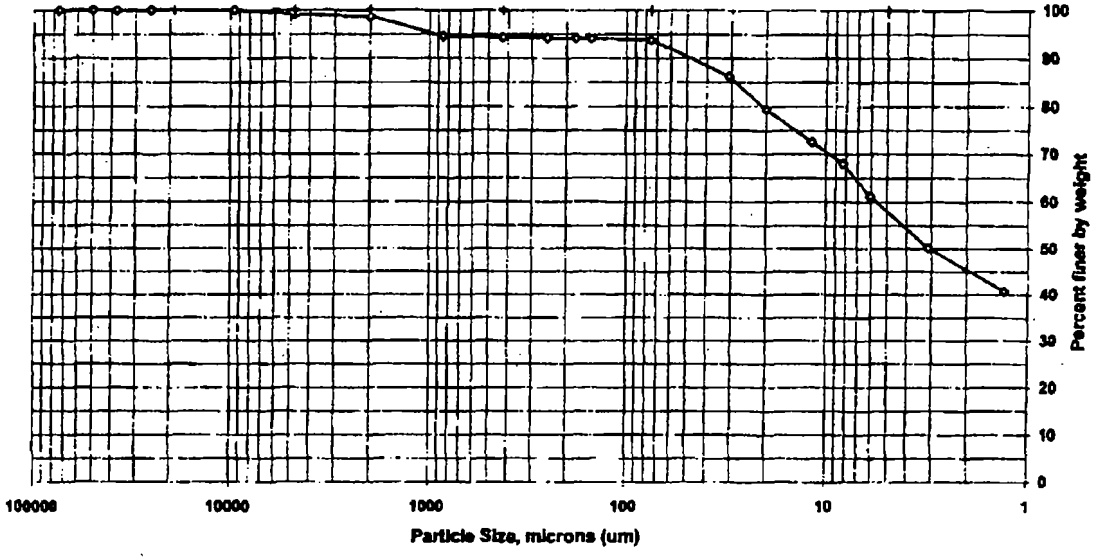
FSL024:07.29.05:0
STL Burlington

7J240208PS 11/21/2007

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7J230246	Date Received:	10/24/2007
Sample ID:	5S	ETR(s):	122645	Start Date:	11/19/2007
Lab ID:	729687			End Date:	11/28/2007

Percent Solids:	26.7%	Non-soil material:	plant, shell
Specific Gravity:	2.650	Shape (> #10):	n/a
Maximum Particle Size:	9.5 mm	Hardness (> #10):	n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	99.1	0.9
#10	2000	98.7	0.5
#20	850	94.6	4.1
#40	425	94.4	0.2
#60	250	94.2	0.1
#80	180	94.2	0.0
#100	150	94.2	0.0
#200	75	93.9	0.3
Hydrometer	31.0	86.3	7.6
	20.0	79.4	6.8
	11.8	72.6	6.8
	8.3	68.0	4.6
	6.1	61.2	6.8
	3.1	50.2	11.0
V	1.3	40.7	9.5

Soil Classification	Percent of Total Sample
Gravel	0.9
Sand	5.3
Coarse Sand	0.5
Medium Sand	4.3
Fine Sand	0.5
Silt	32.7
Clay	61.2

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

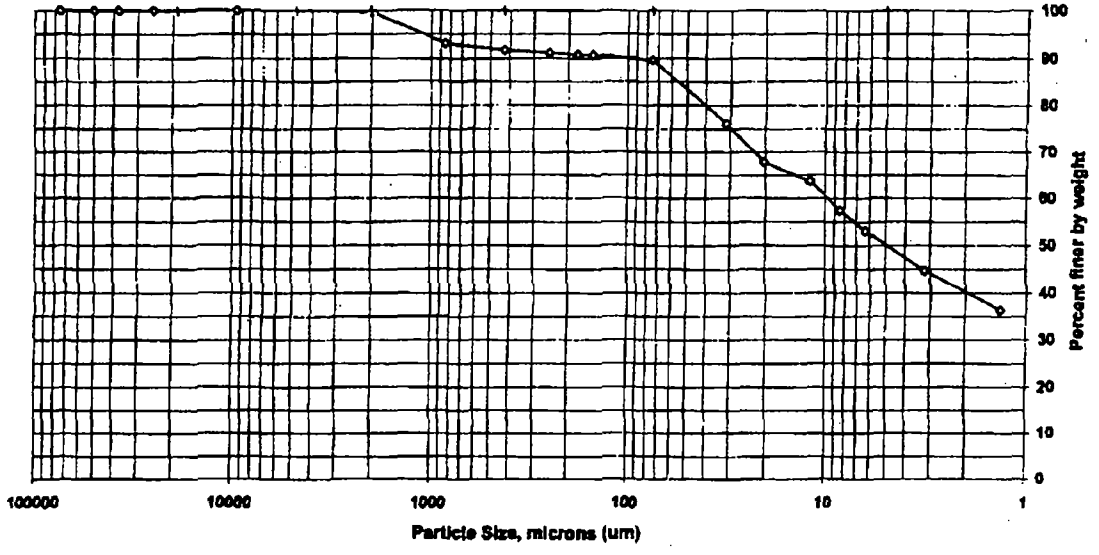
FSL024:07.29.05:0
STL Burlington

7J230246PS 11/29/2007

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7J240208	Date Received:	10/25/2007
Sample ID:	5N	ETR(s):	122644	Start Date:	11/13/2007
Lab ID:	729682			End Date:	11/21/2007

Percent Solids:	27.0%	Non-soil material:	plant
Specific Gravity:	2.650	Shape (> #10):	n/a
Maximum Particle Size:	Crs sand	Hardness (> #10):	n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	100.0	0.0
#4	4750	100.0	0.0
#10	2000	99.7	0.3
#20	850	93.1	6.6
#40	425	91.7	1.4
#60	250	91.2	0.5
#80	180	90.8	0.3
#100	150	90.7	0.1
#200	75	89.7	1.1
Hydrometer	31.4	76.2	13.4
|	20.4	67.9	8.4
|	11.9	63.7	4.2
|	8.4	57.4	6.3
|	6.3	53.1	4.4
|	3.2	44.7	8.4
V	1.3	36.4	8.4

Soil Classification	Percent of Total Sample
Gravel	0.0
Sand	10.3
Coarse Sand	0.3
Medium Sand	8.0
Fine Sand	2.0
Silt	36.6
Clay	53.1

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

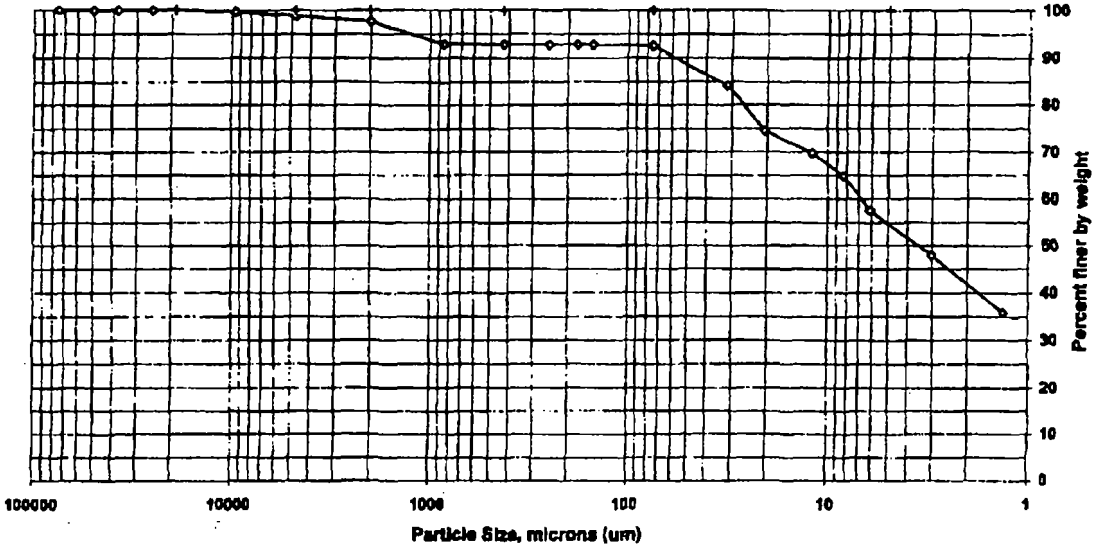
FSL024:07.29.05:0
STL Burlington

7J240208PS 11/21/2007

Particle Size of Soils by ASTM D422

Client Code:	STLPAP	SDG:	7J230246	Date Received:	10/24/2007
Sample ID:	FIELD DUP	ETR(s):	122645	Start Date:	11/19/2007
Lab ID:	729690			End Date:	11/28/2007

Percent Solids:	25.0%	Non-soil material:	plant
Specific Gravity:	2.650	Shape (> #10):	n/a
Maximum Particle Size:	19 mm	Hardness (> #10):	n/a



Sieve size	Particle size, um	Percent finer	Incremental percent
3 inch	75000	100.0	0.0
2 inch	50000	100.0	0.0
1.5 inch	37500	100.0	0.0
1 inch	25000	100.0	0.0
3/4 inch	19000	100.0	0.0
3/8 inch	9500	99.6	0.4
#4	4750	98.9	0.8
#10	2000	97.7	1.2
#20	850	92.8	4.8
#40	425	92.8	0.0
#60	250	92.7	0.1
#80	180	92.7	0.0
#100	150	92.7	0.0
#200	75	92.5	0.2
Hydrometer	31.8	84.2	8.3
I	20.5	74.6	9.7
I	12.0	69.7	4.8
I	6.3	64.9	4.8
I	6.2	57.6	7.3
I	3.0	48.0	9.7
V	1.3	35.9	12.1

Soil Classification	Percent of Total Sample
Gravel	1.1
Sand	6.4
Coarse Sand	1.2
Medium Sand	4.9
Fine Sand	0.3
Silt	34.9
Clay	57.6

Preparation Method: D2217
Dispersion Device: Mechanical mixer with a metal paddle.
Dispersion Period: 1 minute

APPENDIX F
NAPL/Groundwater
Recovery System Correspondence

Craig Zeller /R4/USEPA/US
02/28/2006 04:39 PM

To slenskam@hansonle.com, BDelisio@keyenvir.com, haynesra@dhec.sc.gov, wilsonrs@dhec.sc.gov, canovajl@dhec.sc.gov
cc Craig Zeller/R4/USEPA/US@EPA
bcc
Subject Initial Comments on NAPL/GW Report

Gang -

Here's some "off-the-top-of-my-head" review comments from the January 24, 2006 Performance Evaluation Report for the NAPL/GW remedy component at Koppers-Charleston. I look forward to meeting with ya'll on Thursday at 11 AM to discuss these further.

1) The most important discussion item should be a path forward to getting the FTA and OIA systems back on line (e.g. the Squire access issues). Recent discussions between EPA and Beazer should be shared with SCDHEC.

2) Section 3.2.1 states that "Overall, cumulative NAPL recovery is steadily increasing over time". Indeed, this is good news. I understand the intent of Beazer's initial MNA evaluation included in Section 4 since MNA will undoubtedly be a "piece" of the final remedy implemented at this site. However, EPA believes this MNA evaluation is somewhat premature. Rather, EPA believes the focus should be on how to maximize NAPL recovery in the FTA and OIA.

3) The basis for the NAPL/GW collection systems were developed by groundwater modeling and the Final Design issued in April 2003. In the FTA, the design basis was 7 extraction wells in the SWBZ operating at 0.50 gpm/well (total 3.5 gpm) and 2 new extraction wells (e.g. not counting the two existing IRA wells) in the IWBZ operating at 1.0 gpm/well (total 2.0 gpm). In the OIA, the design basis was 3 extraction wells operating at 1.0 gpm/well (total 3 gpm) and 1 extraction well operating at 0.5 gpm.

4) For the FTA, Table 3-1 indicates average flow rates for SWBZ extraction wells EW-10S (0.26 gpm), EW11S (0.17 gpm) and EW-13S (0.38 gpm) did not achieve the 0.50 gpm design rates. Average flow rates for the 4 IWBZ extraction wells did not achieve the design rate of 1 gpm/well. For the OIA, none of the SWBZ or IWBZ extraction wells achieved the designed groundwater recovery rates. We should discuss how the performance of these wells can be improved to approach rates predicted by the groundwater modeling and design basis.

5) EPA is concerned over monitoring data from the OIA which indicates poor hydraulic containment downstream of MW-102A, and possible gw to sw discharge to the Barge Canal.

6) MW-114 in the FTA is showing approximately 10 feet of NAPL accumulation, nearest EW-04I. Surely, we should be targeting this NAPL mass.

7) Long-Term Montoring Program: EPA agrees that submittal of quarterly O&M Reports at this stage is a bit excessive. However, biennial reporting (e.g. once every two years) is a bit infrequent. We should discuss approrpriate sample frequency and report submittals on Thursday.

8) Table 6-1 lays out the long-term monitoring analytes and proposed monitoring wells. While this is beneficial, a site map with proposed analytes and wells would facilitate discussion. As I recall, ya'll pulled these together for the Final Design. I realize this is rather late notice, but if you could bring these maps to the meeting on Thursday, we could probably have some substantive discussions. Otherwise, the exact wells and analytes may take some more time to iron out after the meeting.

Regards,

Craig Zeller, PE

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C. Earl Hunter, Commissioner
Promoting and protecting the health of the public and the environment.

March 6, 2006

Mr. Craig Zeller
North Superfund Remedial Branch
US EPA Region 4
61 Forsythe Street, S.W.
Atlanta, Georgia 30303

Subject : Performance Evaluation Report – NAPL and Groundwater Remedy
Former Koppers Co. Superfund Site
Charleston, South Carolina

Dear Mr. Zeller :

On January 26, 2006, the Department received the above referenced report on the Former Koppers Co. Superfund Site for review and comment. We have completed our review of the document and generated the following comments based on the review. We request that Beazer East, Inc. respond to the comments in writing prior to the report being revised and re-submitted.

Comments

1. In order to support the interpretation that monitored natural attenuation is the remedy for the site based on the past two years of data, evaluation criteria included in USEPA OSWER Directive 9200.4-17P should be discussed including changes in constituent concentration over time for individual wells, change in the plume dimensions over time, and the overall time frame required to achieve remedial goals for groundwater based on the data that have been collected at the site to date.

2. It appears that the overall DNAPL thickness has decreased in the shallow zone. This supports the remedy selection. However, it also appears that DNAPL has migrated to MW-12S where it has not previously been detected. This does not support natural attenuation as a viable alternative and should be addressed in the report.

3. The DNAPL thickness in the intermediate zone has remained stable in a large portion of the FTA area but appears to have increased in the OIA. This suggests that the extraction in the shallow zone in the OIA may not be sufficient to prevent migration to the deeper zone. Please address in the report.

4. Please explain why MW-114 which contains documented levels of DNAPL is not included in the total BTEX contour map.

5. Section 5.2 of the report should be amended to include time versus concentration and DNAPL thickness versus time graphs for selected parameters for selected sentinel and effectiveness wells including, but not limited to MW-12S, MW-105, MW-102A, EW-04I, MW-202, MW-201S, MW-1S, MW-111R, MW-01SR, MW-110R, CCC-MW-3I. This information will assist in determining the effectiveness of the remedy.

6. Section 6.3 of the report should be amended to include a map highlighting the wells proposed for future monitoring events including the frequency and parameter list. Although this information is found in Table 6-1, a map would be beneficial.

7. Previous reports have indicated an issue with the performance of the extraction wells in the OIA area. Please discuss how this is reflected or is not reflected in the analytical results for this area and in the apparent migration of DNAPL from the shallow to the intermediate zone.

8. Water quality at this MW-105 well should be evaluated to confirm whether capture is affecting the well. Well MW –103B should be added since it appears contamination may be migrating in this direction.

9. Figures 2-3 and 2-4: When evaluating capture zones based on water levels, water levels from extraction wells should not be used due to well losses. Please reconfigure the maps based on monitoring well/piezometer water levels alone. Once the maps have been reconfigured, please illustrate the locations of the hydraulic gradient calculations that were performed to assist in the evaluation of whether the gradient is adequate to mobilize NAPL. (section 3.2.1) Please recalculate those gradients based on the revised map.

10. Section 3.2.1: The calculation of whether the hydraulic gradient is adequate also included assumptions about DNAPL properties. It is likely that properties such as the density and viscosity of the DNAPL likely change over time as a result of weathering. Because DNAPL is being recovered from the site and is readily available, laboratory measurements in support of interfacial tension and contact angle should be made. In addition, the NAPL pool length used in the calculations should be reported.

11. Please provide additional maps similar to Figure 2-9, 2-10, 2-11, and 2-12 posting the information for the January 2006 sampling event.

12. Figure 2-11: Please provide evidence supporting the interpretation of the break in the 500 ug/l contour in the FTA between PZK-12 and TF-MW-01AS. It does not appear that the well in between was sampled.

13. Figure 2-12: The data posted for the FTA do not appear to support the contoured interpretation. Please justify the break in the 50 ug/l and 500 ug/l contour line between EW-04I and MW-100B.

14. The Department is concerned with the PAH concentrations in MW-102A based primarily on the location of the well to the former barge canal and the in-effectiveness of EW-17S to address migration of the plume to the river. The report should address this concern.

15. The report does not propose in surface water or sediment sampling as part of the ongoing performance monitoring. Based on the location of the plume in the OIA to the former barge canal, this issue should be addressed.

16. The Department is willing to wait on additional characterization work in the OIA as discussed in our March 2, 2006 meeting before making recommendations for additional remedial work in the area. Depending on the new data we may request additional capture components in the area including installation of more recovery wells.

If you should have any questions regarding this matter or the site in general, please contact myself at (803) 896-4077 or Judy Canova at (803) 896-4046.

Sincerely,

R. Scott Wilson
Division of Site Assessment and Remediation
Bureau of Land and Waste Management

Judy Canova
Division of Hydrogeology
Bureau of land and Waste Management

cc : Mike Slenska, Beazer East, Inc.
Rick Richter, Trident EQC
51717; file

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C. Earl Hunter, Commissioner

Promoting and protecting the health of the public and the environment.

August 29, 2006

Mr. Craig Zeller, Remedial Project Manager
North Superfund Remedial Branch
US EPA Region 4
100 Alabama Street, S.W.
Atlanta, Georgia 30303

RE: Performance Monitoring Report Responses to Comments
Koppers NPL Site
SCD 980 310 239
Charleston County

The SCDHEC has reviewed the responses to comments on the Performance Monitoring Report for the Kopper's Site. The document has provided new information regarding the conditions of the site, and the Department has a number of suggestions to improve the system performance as well as the long term monitoring of the site based on the new data.

1. A review of the maps showing the locations of NAPL with respect to monitoring wells and dissolved phase concentrations has indicated there are areas of concern that are not monitored for plume migration or remediation effectiveness. The Department has a number of suggestions regarding additional monitoring in these areas including sampling of existing wells and installation of additional wells. The following comments pertain to the sampling of existing wells:

   a) Please add OW-8s and OW-5s to the groundwater quality monitoring schedule. These wells will help assess the containment of the NAPL in the vicinity of EW-2s.

   b) Please add OW-10s to the groundwater quality monitoring schedule to evaluate the effectiveness of the NAPL recovery at EW-05s.

   c) Please add PZK-08 to the groundwater quality monitoring schedule to assess the migration of the plume boundary in this area.

   d) If NAPL is now absent from CCW-MW-3I, the well should be used as a monitoring well and added to the water quality monitoring schedule.

   e) MW-104 should be added to the groundwater monitoring schedule to assist in the evaluation of plume migration.

   f) PZK-02 should be added to the groundwater monitoring schedule to assess the effectiveness of recovery at EW-01R.

g) MW-05I should be added to the groundwater quality monitoring schedule to assess the changes in groundwater contamination in response to recovery operations in the area. This will assist in the evaluation of the effectiveness of recovery at EW-05I.

h) Water quality should be evaluated at CPW-W-1I to determine the impact of EW-03I on the dissolved plume.

i) More recent data from MW-16I is needed to assess contaminant migration in this area.

It is the Department's viewpoint that these wells should be sampled for two consecutive quarters. Depending on the results of analysis, the long-term sampling schedule should be modified to include selected additional sampling points.

2. The Department has identified several areas that need additional monitoring wells to monitor the system effectiveness and potential migration of contaminants. Direct push technology may be used to optimize the well locations. Permanent wells appear to be needed in the following areas:

   a) A monitoring well is needed to the northeast of MW-201s to define the plume boundary in this area and to monitor the restoration of the aqueous plume.

   b) A monitoring well to the east of EW-15s is needed to evaluate whether containment is occurring as a result of the extraction at EW-15s.

   c) A monitoring well to the south of MW-12s is needed to assess the containment of NAPL and restoration of the aqueous phase in this area.

   d) A monitoring well is needed to the south of MW-100B to define the plume boundary in this area.

3. Time versus concentration graphs are needed for MW-203I.

4. The Department is concerned that concentrations of dissolved phase constituents have increased by a factor of ten at MW-22I. Please propose a response to this trend which suggests remedial objectives are not being accomplished in this area.

5. Up to this point, the recovery wells have not performed up to the capacity estimated by the Remedial Design. An evaluation of what can be done to optimize the site remediation may be appropriate. The following items should be considered:

   a) Recovery trenches should be considered as an option for the site to maximize recovery of NAPL.

b) Methods to optimize recovery well performance should be evaluated.

c) Alternate methods to remediate the site should be discussed.

6. According to the ROD, the objectives for site remediation include containment of source areas and restoration of aqueous plumes. Data provided to this point suggests that the objectives are being met at portions of the site, but at other locations, neither objective is being met. Should Beazer wish to continue with the existing recovery system to meet the ROD objectives, the following additions to the system are needed:

Shallow Water-Bearing Zone

a) It does not appear that extraction well EW-16s is affecting the water quality at MW-201S. 15,245 ug/l total PAHs have been identified in MW-201s. To achieve the objective of restoration of the aqueous plume, a recovery well is needed between EW-16s and MW-201s.

b) The Department understands that additional investigation is proposed in the vicinity around MW-102A. Depending on the findings of the investigation and future groundwater monitoring results, an additional extraction well may be needed to control contaminant migration and to restore the aqueous phase in this area.

c) Benzene concentrations at MW-100A have increased significantly over time, and over two feet of NAPL has been noted at the adjacent well PZK-07. A recovery well should be installed at PZK-07 to control source migration and to restore the aqueous plume at MW-100A.

Intermediate Water-Bearing Zone

a) Napthalene concentrations have increased significantly at MW-100B. To control the migration of contamination towards MW-100B from the source, a recovery well should be installed in the southwestern lobe of NAPL in this area.

b) A recovery well should be installed at MW-114. Product levels in this well have fluctuated between ten and thirteen feet, suggesting that the NAPL is mobile in this area and recovery is needed to achieve the ROD objectives.

c) A recovery well is needed in the vicinity of MW-202I and MW-3I. Concentrations of benzene are over 200 times the MCL at MW-202I and have not shown any improvement over the monitoring period.

7. The Department has reviewed the referenced responses to comments and has the following comments regarding the responses:

a) (SCDHEC previous Comment #1): The responses indicate MNA should not be evaluated until the NAPL recovery is completed (ie source of contamination is removed). However, the primary condition that should be met at this site before MNA is evaluated is source containment. If the source of contamination is contained in accordance with the ROD, concentrations of dissolved phase constituents should decrease outside the containment area. Therefore, it is appropriate to begin the MNA evaluation once containment has occurred. The Department does not concur that source containment has occurred at the site and has made a number of suggestions that should allow for source containment and the subsequent evaluation of monitored natural attenuation so that remedial action objectives discussed in the ROD may be achieved. In the interim, time versus concentration maps for benzene and naphthalene should be prepared annually for all wells sampled on a quarterly basis including those recommended in this correspondence. DNAPL thickness versus time graphs should also be presented on an annual basis. All these graphs should be included with the annual monitoring report for the site. This will allow for identification of areas where containment may be an issue at the site.

b) (SCDHEC previous Comment #2): The table provided with the response confirms that DNAPL was not identified in MW-12s until 2005; therefore, it appears that NAPL has migrated into this well.

c) The responses propose biennial monitoring to assess the performance of monitored natural attenuation. In order to determine if monitored natural attenuation is lowering concentrations of constituents at the site, the initial monitoring frequency will need to be quarterly. After quarterly monitoring has demonstrated that concentrations of constituents are decreasing, the monitoring period may be extended to twice a year.

d) (Previous SCDHEC Comment #9): According to the Capture Zone Analysis training presented at NARPM in 2004, use of water levels in recovery wells to evaluate capture and hydraulic gradient is not recommended and therefore cannot be approved for the Koppers site. Corrections for well losses are not reliable. Rather, water levels in adjacent wells and piezometers should be used. There appears to be sufficient monitoring wells and piezometers in the intermediate aquifer to estimate the capture zones and hydraulic gradients in the area. For instance, MW-11I can be used to evaluate the drawdown at EW-04I, MW-101 can be used to evaluate the drawdown at EW-02I, CPW-W-1I may be used to evaluate the water levels at EW-03I, MW-109 may be used to evaluate water levels at EW-05I, and PZK-02 may be used to evaluate the drawdown at EW-01R. In the shallow aquifer at the Former Treatment Area, the water level at OW-8s may be used to evaluate drawdown at EW-02s and MW-106 may be used to evaluate the drawdown at EW-09s. Water levels at MW-02s may be used to evaluate the drawdown at EW-12s. PZK-10 water levels may be used to evaluate drawdown at EW-14s. A piezometer may be added inexpensively using direct push technology in other areas where well coverage is not adequate, such as between EW-04s and EW-05s and adjacent to EW-11s. For the

shallow aquifer in the Old Impoundment Area, the area around EW-15s and EW-16s may need additional water level monitoring points. A revised capture zone evaluation and hydraulic gradient determination should be made which incorporates these recommendations.

e) The Department is not in agreement that bailing product from wells impacted by several feet of DNAPL is sufficient. A peristaltic pump is also not a viable choice for recovery of viscous DNAPL. Recovery wells with automated pumps are needed to adequately capture the DNAPL at the site. Another coal tar site in the Charleston area has had success with the Blackhawk DNAPL recovery system.

f) The responses propose additional characterization work in the vicinity of MW-102A. Please discuss the proposed depth of the soil borings. Contamination has been identified in both the shallow and intermediate aquifers in this area. It is recommended that piezometers in addition to those proposed be installed in the intermediate aquifer in this area. These additional wells should also be evaluated for water levels and water quality. Furthermore, sediment samples should be collected from the barge canal adjacent to MW-102A to evaluate whether sediment in this area has been impacted by contaminated groundwater. Soil sampling is also recommended should zones of visible contamination be identified within the soil borings.

Thank you for the opportunity to review and comment on the referenced document. We look forward to continued progress at the site.

Sincerely,

Judy Canova

Judy Canova, Project Manager
Superfund Section
Division of Hydrogeology
Bureau of Land and Waste Management

Cc: Keith Lindler
Rachel Donica
Lisa Appel
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SF060598.jlc

Beazer

BEAZER EAST, INC. C/O THREE RIVERS MANAGEMENT, INC.
ONE OXFORD CENTRE, SUITE 3000, PITTSBURGH, PA 15219-6401

June 29, 2006

Mr. Craig Zeller
Remedial Project Manager
U.S. Environmental Protection Agency
Waste Management Division
Atlanta Federal Center, 61 Forsyth Street, S.W.
Atlanta, GA 30303

Mr. Scott Wilson
South Carolina Department of Health and Environmental Control
Division of Water Quality Assessment and Enforcement
2600 Bull Street
Columbia, SC 29201

Re: Responses to Comments
GW/DNAPL - Performance Evaluation Report
Former Koppers Company, Inc. Superfund Site
Charleston, South Carolina

Dear Messrs. Zeller and Wilson:

Beazer East, Inc. (Beazer) hereby provides the U.S. Environmental Protection Agency (U.S. EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC) with multiple copies (U.S. EPA – 2, SCDHEC – 3) of the Beazer responses to the SCDHEC (March 6, 2006) and U.S. EPA (February 28, 2006) Comments on the January 24, 2006 Performance Evaluation Report. Attachment 1 includes each comment and the corresponding response thereto. In support of the responses, a scope of work for additional activities related to the MW-102A area (Old Impoundment Area) and a number of figures/revisions are provided. Field activities will be initiated within 30 days of approval of the scope.

If you have any questions regarding this transmittal, or need additional information, please contact me at (412) 208-8867.

Sincerely,

Michael Slenska, P.E.
Environmental Manager

Attachments

cc: Neale Misquitta - KEY

Writer's Direct Dial: 412/208-8867

On behalf of Beazer East, Inc. (Beazer), Key Environmental, Inc. (KEY) has prepared responses to the United States Environmental Protection Agency's (USEPA's) and the South Carolina Department of Health and Environmental Control's (SCDHEC's) comments on the Performance Evaluation Report. USEPA's comments were provided in a February 28, 2006 email from Craig Zeller to Michael Slenska[1]. SCDHEC comments were provided in a March 6, 2006 letter from Scott Wilson and Judy Canova to Craig Zeller[2]. Each USEPA and SCDHEC comment is listed in *italics*, followed by the respective Beazer response thereto.

I. U.S. EPA COMMENTS

USEPA Comment 1: *The most important discussion item should be a path forward to getting the FTA and OIA systems back on line (e.g. the Squire access issues). Recent discussions between EPA and Beazer should be shared with SCDHEC.*

Beazer Response 1: Beazer agrees with USEPA regarding the importance of reactivating the groundwater systems. At this time, access to the Squire Parcel has been restored, and Beazer has returned these systems to full operation. However, for the benefit of SCDHEC, Beazer will briefly recount recent events concerning the issue of access to the 1 acre unimproved parcel owned by John Squire (Squire Parcel) where these systems are situated.

Beazer and Mr. Squire executed two Access Agreements in 1993 and 1996. However, in late 2005, Mr. Squire demanded that Beazer pay $500,000 to purchase the Squire Parcel, or pay $4,000 per month rental. Beazer countered with an offer to purchase the property for $100,000, and in response Mr. Squire gave verbal notice that Beazer was trespassing and that he planned to take legal action to bar Beazer from the property. As a result, Beazer shut down and secured the systems in early November 2005, advising USEPA and SCDHEC of its actions. In January 2006, Mr. Squire's attorney demanded in writing that Beazer "cease utilizing the property."

Between January and March 2006, Beazer and Mr. Squire attempted to resolve the access dispute. Mr. Squire rejected Beazer's offer of $180,000 to transfer the property and release all claims against Beazer. Mr. Squire demanded either $425,000 for sale of the 1 acre Parcel, or $4,500 per month rental. Beazer shared these communications with USEPA, and USEPA then requested that Mr. Squire permit access while Beazer and Mr.

[1] U.S. EPA, February 28, 2006, Initial Comments on NAPL/GW Report, Former Koppers Co. Superfund Site, Charleston, South Carolina.

[2] SCDHEC, March 6, 2007, Performance Evaluation Report – NAPL and Groundwater Remedy, Former Koppers Co. Superfund Site, Charleston, South Carolina.

Squire continued negotiations. Mr. Squire refused. On April 10, 2006, USEPA issued a Unilateral Administrative Order to Mr. Squire that requires access to the Squire Parcel for purposes of operating the systems. Thereafter, Mr. Squire executed a Tolling Agreement with Beazer, agreeing not to take legal action until at least May 24, 2006. On April 25, 2006, Mr. Squire's attorney advised that access to the Squire Parcel for purposes of operating the groundwater systems was restored. Activities related to restart of the system were initiated in May 2006.

USEPA Comment 2: *Section 3.2.1 states that "Overall, cumulative NAPL recovery is steadily increasing over time". Indeed, this is good news. I understand the intent of Beazer's initial MNA evaluation included in Section 4 since MNA will undoubtedly be a "piece" of the final remedy implemented at this site. However, EPA believes this MNA evaluation is somewhat premature. Rather, EPA believes the focus should be on how to maximize NAPL recovery in the FTA and OIA.*

Beazer Response 2: Beazer agrees that the NAPL recovery efforts are positive and that the system is operating as intended to and meeting the Performance Standards for the NAPL remedy at the Site. Also, because MNA is undoubtedly a component of the final remedy, a two-year evaluation was conducted to confirm that this (MNA) component of the final remedy is still viable. As discussed with USEPA and SCDHEC, MNA is anticipated to be fully implemented following completion of the NAPL recovery component.

USEPA Comment 3: *The basis for the NAPL/GW collection systems were developed by groundwater modeling and the Final Design issued in April 2003. In the FTA, the design basis was 7 extraction wells in the SWBZ operating at 0.50 gpm/well (total 3.5 gpm) and 2 new extraction wells (e.g. not counting the two existing IRA wells) in the IWBZ operating at 1.0 gpm/well (total 2.0 gpm). In the OIA, the design basis was 3 extraction wells operating at 1.0 gpm/well (total 3 gpm) and 1 extraction well operating at 0.5 gpm.*

Beazer Response 3: The design basis flow rate was based on the capture zone results simulated by a groundwater flow model compared to the extent of NAPL at the Site. Following the start up of the groundwater/NAPL recovery system in 2003, the NAPL and groundwater capture zones developed was determined to be sufficient at a lower groundwater flow rate, which is the rate that the system is currently operating. Therefore, although the currently operating system groundwater flow rate is lower than the design flow rates, the Performance Standards are still being achieved.

***USEPA Comment 4**: For the FTA, Table 3-1 indicates average flow rates for SWBZ extraction wells EW-10S (0.26 gpm), EW11S (0.17 gpm) and EW-13S (0.38 gpm) did not achieve the 0.50 gpm design rates. Average flow rates for the 4 IWBZ extraction wells did not achieve the design rate of 1 gpm/well. For the OIA, none of the SWBZ or IWBZ extraction wells achieved the designed groundwater recovery rates. We should discuss how the performance of these wells can be improved to approach rates predicted by the groundwater modeling and design basis.*

Beazer Response 4: The NAPL recovery at these locations has been progressing with satisfactory results, despite not achieving the groundwater pumping rates assumed in the groundwater model. This may be due to heterogeneities in the unconsolidated coastal sediments.

***USEPA Comment 5**: EPA is concerned over monitoring data from the OIA which indicates poor hydraulic containment downstream of MW-102A, and possible gw to sw discharge to the Barge Canal.*

Beazer Response 5: As discussed during the March 2, 2006 meeting, Beazer is equally concerned about the apparent increase in constituent concentrations in MW-102A of the OIA. This well has historically been absent of constituents of concern at the Site. However, steady increases in constituent concentrations in this well occurred shortly after initiation of NAPL recovery in this area. The last two quarters of analytical data (October 2005 and January 2006) suggest the increasing trend has abated, with naphthalene concentrations dropping from 11,500 micrograms per liter (ug/l) in July 2005 to 4,530 ug/l in January 2006, and benzene concentrations dropping from 74.9 ug/l in July 2005 to 19.1 ug/l in January 2006. It is important to note that the NAPL recovery system has been inoperable in this area since November 11, 2005.

It appears that operation of the SWBZ NAPL recovery system may be contributing to the increase in constituent concentrations observed in MW-102A. Other factors may also be contributing to this change as well. During the summer of 2003, remedial activities associated with the Braswell Street storm sewer were performed in this area. These activities included pressure grouting around the storm sewer to minimize migration of NAPL along the pipe bedding. These remedial activities, coupled with operation of the NAPL recovery system, may be contributing to changing groundwater flow conditions in the OIA. Therefore, Beazer proposes to perform additional field investigation activities to further characterize the nature of groundwater flow in the OIA and extent of groundwater impacts. Field activities will include the following:

- Soil Borings: Approximately eight (8) soil borings will be completed in the vicinity of MW-102A and within the OIA to further characterize the subsurface geologic conditions that may be contributing to groundwater migration. Figure 1 shows the location of proposed soil borings.

- Piezometers: Four (4) piezometers will be installed in the SWBZ of the OIA. Piezometers will be located in the vicinity of MW-102A, near the Braswell Street storm sewer, and within the OIA to further characterize groundwater flow in the region near MW-102A and downgradient of the NAPL recovery system. Figure 1 shows the location of the proposed piezometers.

- Hydraulic Monitoring/Groundwater Sampling: Water levels in the SWBZ will be recorded in all newly installed piezometers as well as in the existing monitoring well network including MW-102A, MW-103A, PZ-200, PZ-201, and MW-201S. This information will be used to more clearly quantify groundwater flow characteristics in the OIA. In addition, groundwater samples will be collected from the four (4) piezometers as well as the existing monitoring well network listed above. Samples will be analyzed for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) using methods consistent with the Comprehensive Environmental Monitoring Plan (CEMP).

  Following collection of this field data, Beazer will prepare a letter report for submission to USEPA and SCDHEC to present the results of the field evaluation and to make recommendations for further investigative and/or remedial activities.

USEPA Comment 6: *MW-114 in the FTA is showing approximately 10 feet of NAPL accumulation, nearest EW-04I. Surely, we should be targeting this NAPL mass.*

Beazer Response 6: Beazer agrees that NAPL accumulation in MW-114 should be targeted. Therefore, Beazer will initiate a program to periodically remove NAPL from MW-114 using a bailer or peristaltic pump. Following the initial NAPL removal, Beazer will monitor MW-114 on a monthly basis for additional NAPL accumulation. When more than 1-foot of NAPL accumulates in the well, it will be removed and managed in conjunction with other NAPL that is recovered at the Site. If NAPL accumulation in this well remains below 1-foot for three consecutive quarters, monthly monitoring will cease and NAPL accumulation will be monitored in conjunction with the site-wide groundwater monitoring program.

***USEPA Comment** 7: Long-Term Monitoring Program: EPA agrees that submittal of quarterly O&M Reports at this stage is a bit excessive. However, biennial reporting (e.g. once every two years) is a bit infrequent. We should discuss appropriate sample frequency and report submittals on Thursday.*

Beazer Response 7: Beazer, USEPA, and SCDHEC discussed this issue during the project meeting. Additional recommendations will be provided following the next quarterly groundwater monitoring event.

***USEPA Comment** 8: Table 6-1 lays out the long-term monitoring analytes and proposed monitoring wells. While this is beneficial, a site map with proposed analytes and wells would facilitate discussion. As I recall, ya'll pulled these together for the Final Design. I realize this is rather late notice, but if you could bring these maps to the meeting on Thursday, we could probably have some substantive discussions. Otherwise, the exact wells and analytes may take some more time to iron out after the meeting.*

Beazer Response 8: Beazer agrees with the above comment. Attached are three (3) site maps showing the proposed long-term monitoring program for the SWBZ of the FTA and OIA (Figure 2), the IWBZ of the FTA and OIA (Figure 3), and the SWBZ of the Northwest Corner (Figure 4).

II. SCDHEC COMMENTS

***SCDHEC Comment 1:** In order to support the interpretation that monitored natural attenuation is the remedy for the site based on the past two years of data, evaluation criteria included is USEPA OSWER Directive 9200.4-17P should be discussed including changes in constituent concentration over time for individual wells, change in the plume dimensions over time, and the overall time frame required to achieve remedial goals for groundwater based on the data that have been collected at the site to date.*

Beazer Response 1: The purpose of the evaluation was to demonstrate and document that MNA is a viable remedial approach at the Site when the NAPL recovery (and groundwater recovery) component is completed. At such time that MNA is proposed to be implemented as a stand-alone remedy, a more detailed evaluation will be completed including addressing the issues identified above. Nevertheless, attached to this submittal are Figures 7 through 10 that address the above SCDHEC comment.

***SCDHEC Comment 2**: It appears that the overall DNAPL thickness has decreased in the shallow zone. This supports the remedy selection. However, it also appears that DNAPL has migrated to MW-12S where it has not previously been detected. This does not support natural attenuation as a viable alternative and should be addressed in the report.*

Beazer Response 2: Beazer agrees that overall DNAPL thickness has decreased in the shallow zone, as evident by the volume of DNAPL removed during the two (2) years of operation (Figure 5). However, Beazer disagrees that DNAPL has migrated to MW-12S, where it has not previously been detected. In fact, MW-12S was included within the "inferred NAPL source area" for the SWBZ as identified in the 100% NAPL/Groundwater Remedial Design. This "inferred NAPL source area" was established in the NAPL/Groundwater Pre-Design Activities Report and describes the area where "recoverable" NAPL was present within the FTA. During the baseline monitoring event and several quarterly events, NAPL was not detected in MW-12S. However, during other monitoring events NAPL was detected in the well but at trace or very low levels. The following table provides a summary of NAPL thickness measurements in MW-12S.

Table 1
MW-12S NAPL Thickness Measurements

Sampling Event	Date	NAPL Thickness (ft.)
Baseline	9/16/03	0.0
1st Qtr 2004	1/26/04	0.0
2nd Qtr 2004	4/12/04	0.0
3rd Qtr 2004	7/5/04	0.0
4th Qtr 2004	10/5/04	0.0
1st Qtr 2005	1/4/05	0.2
2nd Qtr 2005	4/13/05	0.0
3rd Qtr 2005	7/18/05	Trace
4th Qtr 2005	10/3/05	Trace
1st Qtr 2006	2/14/06	Trace

Based on this data and the historical documents, MW-12S (primarily the June 28, 1993 boring log from the RI Report, dated January 1995) is within the anticipated "inferred NAPL source area" and it is not surprising that NAPL is evident in the well periodically. Furthermore, monitoring well MW-12S is upgradient from the main NAPL source zone within the SWBZ of the FTA. Therefore, the periodic presence of NAPL in this well does not preclude natural attenuation as a remedy for this area.

SCDHEC Comment 3: *The DNAPL thickness in the intermediate zone has remained stable in a large portion of the FTA area but appears to have increased in the OIA. This suggests that the extraction in the shallow zone in the OIA may not be sufficient to prevent migration to the deeper zone. Please address in the report.*

Beazer Response 3: Beazer disagrees that DNAPL thicknesses in the intermediate zone have increased in the OIA (Figure 6). In fact, DNAPL has only been detected in the IWBZ NAPL recovery well (EW-05I). NAPL has never been detected in any of the monitoring wells in the OIA including MW-201I, MW-109, MW-05I, MW-103B, and MW-102B. Periodic fluctuations in the NAPL thicknesses measured in EW-05I are related to NAPL removal activities. Recovery well EW-05I has an approximately 65-gallon sump in which NAPL accumulates over time. Periodically, NAPL is removed from the sump and disposed off-site. Therefore, it is entirely possible that measured NAPL thicknesses in the well will vary depending on when monitoring was performed in relation to when NAPL was removed for disposal. Therefore, Beazer does not believe that extraction in the SWBZ is insufficient to prevent migration to the deeper zone.

SCDHEC Comment 4: *Please explain why MW-114 which contains documented levels of DNAPL is not included in the total BTEX contour map.*

Beazer Response 4: MW-114 was not analyzed for BTEX and did not screen out from the database for the generation of the referenced Figure. Future submittals will incorporate the extent of DNAPL within the extent of BTEX.

SCDHEC Comment 5: *Section 5.2 of the report should be amended to include time versus concentration and DNAPL thickness versus time graphs for selected parameters for selected sentinel and effectiveness wells including, but not limited to MW-12S, MW-105, MW-102A, EW-04I, MW-202, MW-201S, MW-1S, MW-111R, MW-01SR, MW-110R, CCC-MW-3I. This information will assist in determining the effectiveness of the remedy.*

Beazer Response 5: This request was completed and the results are attached for your review on Figures 7 through 10.

SCDHEC Comment 6: *Section 6.3 of the report should be amended to include a map highlighting the wells proposed for future monitoring events including the frequency and parameter list. Although this information is found in Table 6-1, a map would be beneficial.*

Beazer Response 6: See Beazer's response to USEPA Comment 8.

***SCDHEC Comment** 7: Previous reports have indicated an issue with the performance of the extraction wells in the OIA area. Please discuss how this is reflected or is not reflected in the analytical results for this area and in the apparent migration of DNAPL from the shallow to the intermediate zone.*

Beazer Response 7: See Beazer's response to USEPA Comment 4 and Comment 5.

***SCDHEC Comment** 8: Water quality at this MW-105 well should be evaluated to confirm whether capture is affecting the well. Well MW-103B should be added since it appears contamination may be migrating in this direction.*

Beazer Response 8: Water quality has been monitored at MW-105 since the start of the performance monitoring period. A baseline sample was collected in September 2003 and eight (8) subsequent quarterly monitoring events have included this well. The results of analytical testing in this well were included in the Performance Evaluation Report. See Beazer's response to SCDHEC Comment 5 for further evaluation of water quality in MW-105.

MW-103B, which is located in the IWBZ downgradient of the NAPL recovery system in the OIA, was sampled as part of the baseline event in September 2003. The results of this sampling did not indicate the presence of elevated levels of PAHs or VOCs. Nonetheless, Beazer agrees that MW-103B should be added to the monitoring program in light of the elevated concentrations of constituents in monitoring well MW-102B and MW-05I. Monitoring well MW-103B will be included in future sampling events and results will be reported in future operations and monitoring reports.

***SCDHEC Comment** 9: Figures 2-3 and 2-4: When evaluating capture zones based on water levels, water levels from extraction wells should not be used due to well losses. Please reconfigure the maps based on monitoring well/piezometer water levels alone. Once the maps have been reconfigured, please illustrate the locations of the hydraulic gradient calculations that were performed to assist in the evaluation of whether the gradient is adequate to mobilize NAPL (section 3.2.1). Please recalculate those gradients based on the revised map.*

Beazer Response 9: Beazer does not agree that the water level data from the extraction wells can be ignored, however, there are likely well losses within the recovery wells that make the drawdown subject to well efficiency corrections. For future groundwater monitoring submittals, Beazer will apply a correction factor for well efficiency or obtain direct piezometric measurements within the aquifer to evaluate the actual drawdown in the recovery wells. This information will be included in the capture zone analyses.

***SCDHEC Comment 10**: Section 3.2.1: The calculation of whether the hydraulic gradient is adequate also included assumptions about DNAPL properties. It is likely that property such as the density and viscosity of the DNAPL likely change over time as a result of weathering. Because DNAPL is being recovered from the site and is readily available, laboratory measurements in support of interfacial tension and contact angle should be made. In addition, the NAPL pool length used in the calculations should be reported.*

Beazer Response 10: Beazer agrees that the critical hydraulic gradient required to mobilize NAPL is a function of the physical properties of the NAPL. In addition, Beazer acknowledges that the physical properties of NAPL may be changing over time, and therefore, assumptions made in evaluating NAPL capture may be invalid. Therefore, Beazer proposes to collect samples of NAPL from the SWBZ and IWBZ in both the FTA and OIA. These samples will be tested for interfacial tension between the NAPL and groundwater, contact angle between the NAPL and soil, viscosity, and specific gravity. This information, along with the estimated NAPL pool length of 80 feet, will be used in the model to recalculate the critical hydraulic gradients and to determine NAPL capture. In addition, a sensitivity analysis will be performed to determine the effects of varying NAPL pool lengths on the critical hydraulic gradient required to mobilize NAPL. The following test methods will be used:

Interfacial Tension Measurements	ASTM D971
Contact Angle	ASTM D5946
Specific Gravity	ASTM D1298
Viscosity	ASTM D445

***SCDHEC Comment 11**: Please provide additional maps similar to Figure 2-9, 2-10, 2-11, and 2-12 posting the information for the January 2006 sampling event.*

Beazer Response 11: As requested, Figures 2-9, 2-10, 2-11, and 2-12 have been revised to reflect the information from the January 2006 sampling event and are included herein. In generating the revised maps, SCDHEC Comments 4, 12, and 13 have been considered.

***SCDHEC Comment 12**: Figure 2-11: Please provide evidence supporting the interpretation of the break in the 500 ug/l contour in the FTA between PZK-12 and TF-MW-01AS. It does not appear that the well in between was sampled.*

Beazer Response 12: These data were revisited and sampling results from well MW-113 is not in our data base. Therefore, we have re-contoured these data taking into consideration the lateral extent of NAPL and presented them for your evaluation and discussion.

SCDHEC Comment 13: *Figure 2-12: The data posted for the FTA do not appear to support the contoured interpretation. Please justify the break in the 50 ug/l and 500 ug/l contour line between EW-04I and MW-100B.*

Beazer Response 13: The data posted on this drawing are appropriately contoured given their values and spatial distribution. This drawing was revised to better represent the assumed groundwater conditions in areas where NAPL has been detected.

SCDHEC Comment 14: *The Department is concerned with the PAH concentrations in MW-102A based primarily on the location of the well to the former barge canal and the in-effectiveness of EW-17S to address migration of the plume to the river. The report should address this concern.*

Beazer Response 14: See Beazer's response to USEPA Comment 5.

SCDHEC Comment 15: *The report does not propose in surface water or sediment sampling as part of the ongoing performance monitoring. Based on the location of the plume in the OIA to the former barge canal, this issue should be addressed.*

Beazer Response 15: See Beazer's response to USEPA Comment 5.

SCDHEC Comment 16: *The Department is willing to wait on additional characterization work in the OIA as discussed in our March 2, 2006 meeting before making recommendations for additional remedial work in the area. Depending on the new data we may request additional capture components in the area including installation of more recovery wells.*

Beazer Response 16: Beazer appreciates the SCDHEC's willingness to wait on additional characterization work. See Beazer's response to USEPA Comment 5 for additional information about Beazer's proposed characterization work in the OIA.

Beazer

BEAZER EAST, INC. C/O THREE RIVERS MANAGEMENT, INC.
ONE OXFORD CENTRE, SUITE 3000, PITTSBURGH, PA 15219-6401

March 20, 2007

Mr. Craig Zeller, P.E.
Remedial Project Manager
U.S. Environmental Protection Agency
Waste Management Division
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Atlanta, GA 30303

Mr. Don Siron
Manager Federal Remediation Section
Division of Site Assessment and
Remediation
Bureau of Land and Waste Mgmt.
2600 Bull Street
Columbia, SC 29201

Re: Submittal of Responses to Comments
Former Koppers Company, Inc. Superfund Site
Charleston, South Carolina

Dear Mr. Zeller:

Beazer East, Inc. (Beazer) hereby provides the U.S. Environmental Protection Agency (U.S. EPA) and the South Carolina Department of Health and Environmental Control (SCDHEC) responses to the June 30, 2006 Comments on the January 24, 2006 Performance Evaluation Report for the above-referenced site. The attached pages include each comment and the corresponding response thereto. Beazer is prepared to move forward with the additional activities identified within these responses as well as with the scope of work for additional activities related to the MW-102A area (Old Impoundment Area), previously provided to U.S. EPA and SCDHEC.

In the Performance Evaluation Report, Beazer had indicated that groundwater monitoring should be completed on a bi-annual (once every two years) basis. Based on the additional activities identified, Beazer hereby modifies that request to perform future monitoring on a semi-annual basis (twice a year). Following completion of the additional activities and providing a report to U.S. EPA, a separate request will be provided to U.S. EPA and SCDHEC regarding the groundwater monitoring program. Field activities, including those related to the Old Impoundment Area, will be initiated within 30 days of approval of the scope.

If you have any questions regarding this transmittal, or need additional information, please contact me at (412) 208-8867.

Sincerely,

Michael Slenska, P.E.
Environmental Manager

Attachments

cc:\ Neale Misquitta - KEY

Responses to Comments
Performance Monitoring Report Responses to Comments
Former Koppers Site - SCD 980 310 239
March 16, 2007

On behalf of Beazer East, Inc. (Beazer), Key Environmental, Inc. (KEY) has prepared responses to the South Carolina Department of Health and Environmental Control (SCDHEC) comments[1] to the Performance Monitoring Plan[2] (PMP). Each SCDHEC comment is reiterated in plain text followed by the respective Beazer response thereto in *italicized* text.

It is clear from reviewing the SHDEC comments in whole that SCDHEC is looking for a way to determine if constituents related to the NAPL source areas are migrating to new areas, or are increasing in concentration to new, downgradient areas. Beazer agrees that some modifications to the current monitoring program may assist to clarify this, now that two years of consistent baseline monitoring data have been acquired. However, it is vital to keep the site conceptual model in mind when choosing these detection monitoring well locations. Some of the wells proposed for addition to the groundwater quality monitoring schedule are either: 1) located within or adjacent to the inferred extent of NAPL, and/or upgradient or side-gradient to the source area, or 2) within the capture zone; note that wells within the capture zone may be influenced by the action of the recovery wells forcing NAPL movement.

In the following paragraphs, Beazer addresses each comment specifically and make alternative recommendations, as appropriate.

***SCDHEC Comment 1**: A review of the maps showing the locations of NAPL with respect to monitoring wells and dissolved phase concentrations has indicated there are areas of concern that are not monitored for plume migration or remediation effectiveness. The Department has a number of suggestions regarding additional monitoring in these areas including sampling of existing wells and installation of additional wells. The following comments pertain to the sampling of existing wells:*

FTA – SWBZ

a) Please add OW-8s and OW-5s to the groundwater quality monitoring schedule. These wells will help assess the containment of the NAPL in the vicinity of EW-2s.

Response1a: Note that OW-8S is adjacent to and OW-5S is upgradient of EW-2S and the inferred extent of NAPL. Also, these wells were installed with the objective to serve as observation wells in the vicinity of the source area and not as monitoring wells. However, because no historic data for these wells has been located, Beazer agrees to sample these wells for site-related constituents of interest for the next two monitoring events. Because these areas are located proximal to the inferred extent of NAPL, relatively elevated concentrations of dissolved phase constituent concentrations are anticipated. Following the two proposed groundwater monitoring events, decisions will be made regarding the need for additional monitoring at these locations.

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[1] SCDHEC, Comments to the Performance Monitoring Plan, provided to U.S. EPA on June 30, 2006.
[2] Beazer, Performance Monitoring Plan, submitted to U.S. EPA on November 2005.

FTA - SWBZ

b) Please add OW-10s to the groundwater quality monitoring schedule to evaluate the effectiveness of the NAPL recovery at EW-05s.

FTA - SWBZ

Response 1b: Note that OW-10S is already included in the annual groundwater quality monitoring program and three rounds of annual data have already been collected.

FTS - SWBZ

c) Please add PZK-08 to the groundwater quality monitoring schedule to assess the migration of the plume boundary in this area.

Response 1c: This well is also included in the current annual monitoring program and three rounds of annual data have been collected.

FTA - IWBZ

d) If NAPL is now absent from CCW-MW-3I, the well should be used as a monitoring well and added to the water quality monitoring schedule.

Response 1d: Please note that MW-104, located approximately 100 feet west of CCW-MW-3I will be included in the monitoring program and data from this well meets the same objective as data from CCW-MW-3I.

FTA - IWBZ

e) MW-104 should be added to the groundwater monitoring schedule to assist in the evaluation of plume migration.

Response 1e: This well will be sampled for the next two groundwater monitoring events, as discussed in Response to Comment 1d. Thereafter, this data will be evaluated to determine if additional monitoring is necessary.

FTA - IWBZ

f) PZK-02 should be added to the groundwater monitoring schedule to assess the effectiveness of recovery at EW-01R.

Response 1f: Beazer does not agree that analytical data from PZK-02 will help assess the effectiveness of recovery at EW-01R because there is no baseline analytical data previous to the initiation of pumping. The pre-pumping data is critical to be able to draw conclusions while comparing the relationship of DNAPL recovery with dissolved phase concentrations in adjacent wells. Also, PZK-02 is included in the current NAPL monitoring program and is gauged on a quarterly basis. No NAPL has been observed in PZK-02.

OIA - IWBZ

g) MW-05I should be added to the groundwater quality monitoring schedule to assess the changes in groundwater contamination in response to recovery operations in the area. This will assist in the evaluation of the effectiveness of recovery at EW-05I.

Response 1g: This well is already included in the annual monitoring program and analytical data has been collected over the past three annual events. The well was also previously sampled in 1998 and 1999.

FTA - IWBA

h) Water quality should be evaluated at CPW-W-1I to determine the impact of EW-03I on the dissolved plume.

Response 1h: Beazer does not agree that analytical data from CPW-W-1I will contribute any information regarding the aqueous plume. This well is located within the area of hydraulic containment and adjacent to EW-03I. This is an example of a situation where the pumping action of EW-03I may pull NAPL across the location of CPW-W-I1. Therefore, an increase in constituent concentrations would not be indicative of what is occurring within the dissolved plume, but rather may be an indication that EW-03I is effectively pumping impacted groundwater in close vicinity of the source area.

FTA - IWBZ

i) More recent data from MW-16I is needed to assess contaminant migration in this area.

It is the Department's viewpoint that these wells should be sampled for two consecutive quarters. Depending on the results of analysis, the long-term sampling schedule should be modified to include selected additional sampling points.

Response 1i: CPW-W-16I is outside of the identified remediation area and adjacent to two monitoring wells already included in the current monitoring program: CPW-W-8I is sampled annually and MW-101B is sampled quarterly.

2. *The Department has identified several areas that need additional monitoring wells to monitor the system effectiveness and potential migration of contaminants. Direct push technology may be used to optimize the well locations. Permanent wells appear to be needed in the following areas:*

OIA - SWBZ

a) *A monitoring well is needed to the northeast of MW-201s to define the plume boundary in this area and to monitor the restoration of the aqueous plume.*

Response 2a: Beazer will extend its proposed investigation of the MW-102A area to include the area upgradient of MW-201S.

OIA - SWBZ

b) *A monitoring well to the east of EW-15s is needed to evaluate whether containment is occurring as a result of the extraction at EW-15s.*

Response 2b: Beazer will extend its proposed investigation of the MW-102A area to include the area upgradient of EW-15S.

FTA - SWBZ

c) *A monitoring well to the south of MW-12s is needed to assess the containment of NAPL and restoration of the aqueous phase in this area.*

Response 2c: Trace or thin NAPL has been detected intermittently in MW-12S. Pending access to this area, a piezometer will be installed to the south.

FTA - IWBZ

d) *A monitoring well is needed to the south of MW-100B to define the plume boundary in this area.*

Response 2d: Beazer will install a monitoring well to the south of this location.

FTA - IWBZ

3. *Time versus concentration graphs are needed for MW-203I.*

Response 3: Concentrations of indicator constituents are largely non detect at this location.

FTA - IWBZ

4. The Department is concerned that concentrations of dissolved phase constituents have increased by a factor of ten at MW-22I. Please propose a response to this trend which suggests remedial objectives are not being accomplished in this area.

Response 4: This well is currently sampled annually and concentrations of indicator parameters benzene and naphthalene have fluctuated from non-detect to 2.0 ug/l to 19.3 ug/l and 21.8 ug/l to 204 ug/l, respectively, since the startup of the remediation system. Insufficient data has been collected to date to establish confidence in a trend. Beazer will continue to monitor data from his well during future monitoring events. Also note that MW-104 and MW-203 I (downgradient of this location) are monitored and MW-203I is largely non-detect.

GENERAL

5. *Up to this point, the recovery wells have not performed up to the capacity estimated by the Remedial Design. An evaluation of what can be done to optimize the site remediation may be appropriate. The following items should be considered:*

   a) Recovery trenches should be considered as an option for the site to maximize recovery of NAPL.

   b) Methods to optimize recovery well performance should be evaluated.

   c) Alternate methods to remediate the site should be discussed.

Response 5: The gradient-enhanced DNAPL recovery system has been effective in removing DNAPL from the source zones. DNAPL recovery is an FS-approved remedial measure and is an effective source zone remedial measure. As of December 2006, the system had removed a total of 10,000 gallons of DNAPL from the source areas. While the current system has not needed to achieve the groundwater recovery rate estimated in the Remedial Design, the ultimate objective of product removal should not be compromised in an attempt to produce more water. In fact, pumping of additional water, if possible, could result in decreasing the amount of DNAPL recovered. Note that increasing the groundwater pumping rate increases the pressure on the subsurface NAPL and changes the NAPL-groundwater fluid dynamics, potentially pinching and blinding off the NAPL source from the recovery well and reducing the quantity of NAPL recovered and also reducing the NAPL recovery efficiency.

6. *According to the ROD, the objectives for site remediation include containment of source areas and restoration of aqueous plumes. Data provided to this point suggests that the objectives are being met at portions of the site, but at other locations, neither objective is*

being met. Should Beazer wish to continue with the existing recovery system to meet the ROD objectives, the following additions to the system are needed:

Shallow Water-Bearing Zone

OIA - SWBZ

a) *It does not appear that extraction well EW-16s is affecting the water quality at MW-201S. 15,245 ug/l total PAHs have been identified in MW-201s. To achieve the objective of restoration of the aqueous plume, a recovery well is needed between EW-16s and MW-201s.*

SWBZ Response 6a: The investigation proposed for the Old Impoundment Area may provide information regarding what additional measures in the Old Impoundment Area will be beneficial. In addition to the new data, it is important to consider that EW-16S is one of the most productive wells for recovering DNAPL on Site (approximately 1,800 gallons of NAPL recovered from this location) and that changing the gradient in the vicinity of EW-16S may have a negative overall impact of reducing total amount of NAPL recovered from this location. Note also that MW-201S is directly upgradient of EW-16S and therefore is inherently located within the containment area.

OIA - SWBZ

b) *The Department understands that additional investigation is proposed in the vicinity around MW-102A. Depending on the findings of the investigation and future groundwater monitoring results, an additional extraction well may be needed to control contaminant migration and to restore the aqueous phase in this area.*

SWBZ Response 6b: See response 6a.

FTA - SWBZ

c) *Benzene concentrations at MW-100A have increased significantly over time, and over two feet of NAPL has been noted at the adjacent well PZK-07. A recovery well should be installed at PZK-07 to control source migration and to restore the aqueous plume at MW-100A.*

SWBZ Response 6c: Beazer agrees that while benzene concentrations have increased at MW-100A, the naphthalene concentrations have remained relatively stable. So the overall picture at this location does not indicate a source control issue. In addition, in response to comment 2d, Beazer agreed to install an additional monitoring well south of this location within the IWBZ and data from this location will be used for potential decision-making at the MW-100A location.

Intermediate Water-Bearing Zone

FTA - IWBZ

a) Naphthalene concentrations have increased significantly at MW-100B. To control the migration of contamination towards MW-100B from the source, a recovery well should be installed in the southwestern lobe of NAPL in this area.

IWBZ Response 6a: As indicated in the Beazer response to comment 2d, additional borings/monitoring well will be completed to the south of this location. Additional DNAPL recovery activities (including passive/gradient enhanced) will be evaluated following completion of the additional investigative activities at this location.

FTA - IWBZ

b) A recovery well should be installed at MW-114. Product levels in this well have fluctuated between ten and thirteen feet, suggesting that the NAPL is mobile in this area and recovery is needed to achieve the ROD objectives.

IWBZ Response 6b: This well is located in the center of the source area and is surrounded by recovery wells. Two of the recovery wells in the vicinity of MW-114, EW-03I (located about 150 NW of MW-114) and EW-04I (located about 100 ft NE of MW-114) are presently not recovering DNAPL. This indicates that another recovery well in this location is not productive. Beazer proposes passive recovery testing at the MW-114 location for approximately six months to determine DNAPL recovery potential.

FTA - IWBZ

c) A recovery well is needed in the vicinity of MW-202I and MW-3I. Concentrations of benzene are over 200 times the MCL at MW-202I and have not shown any improvement over the monitoring period.

IWBZ Response 6c: Two to three years of NAPL recovery is not a sufficient time to see improved groundwater quality at all locations, particularly locations immediately downgradient of the source area. Review of the quarterly data collected from MW-203I, downgradient of MW-202I, shows no increase in constituent concentrations over time, with the most recent total detected PAHs at 17.1 ug/l and no detections of benzene since the groundwater monitoring program began in 2003. Improvement in groundwater quality (solely in response to NAPL recovery) at a NAPL site should not be anticipated within a reasonable timeframe due to the residual/non recoverable NAPL acting as a long term source for dissolved phase concentrations. For this reason, NAPL recovery is conducted in conjunction with adjunct approaches such as MNA.

7. *The Department has reviewed the referenced responses to comments and has the following comments regarding the responses:*

GENERAL

a) (SCDHEC previous Comment #1): The responses indicate MNA should not be evaluated until the NAPL recovery is completed (i.e. source of contamination is removed). However, the primary condition that should be met at this site before MNA is evaluated is source containment. If the source of contamination is contained in accordance with the ROD, concentrations of dissolved phase constituents should decrease outside the containment area. Therefore, it is appropriate to begin the MNA evaluation once containment has occurred. The Department does not concur that source containment has occurred at the site and has made a number of suggestions that should allow for source containment and the subsequent evaluation of monitored natural attenuation so that remedial action objectives discussed in the ROD may be achieved. In the interim, time versus concentration maps for benzene and naphthalene should be prepared annually for all wells sampled on a quarterly basis including those recommended in this correspondence. DNAPL thickness versus time graphs should also be presented on an annual basis. All these graphs should be included with the annual monitoring report for the site. This will allow for identification of areas where containment may be an issue at the site.

Response 7a: Time versus concentration graphs and time versus DNAPL thickness graphs will be included in the Annual reports.

FTA - SWBZ

b) (SCDHEC previous Comment #2): *The table provided with the response confirms that DNAPL was not identified in MW-12s until 2005; therefore, it appears that NAPL has migrated into this well.*

Response 7b: The quantities of DNAPL reported in this well since Oct. 5, 2004 range from 0.01 to 0.2 ft. A similar measurement of 0.01 ft was reported on September 16, 2003, indicating that this detection is residual and the observation is recurrent and not indicative of migration of NAPL.

GENERAL

c) The responses propose biennial monitoring to assess the performance of monitored natural attenuation. In order to determine if monitored natural attenuation is lowering concentrations of constituents at the site, the initial monitoring frequency will need to be quarterly. After quarterly monitoring has demonstrated that concentrations of constituents are decreasing, the monitoring period may be extended to twice a year.

Response 7c: Initial quarterly monitoring is useful to determine a baseline condition for the monitoring wells. The baseline data can then be used to identify data gaps which may

require additional sampling in the near term, but considering that the remedy is long-term, continued quarterly monitoring is not beneficial at this time. A monitoring frequency of twice per year or less is sufficient to track improvements from the established baseline concentrations obtained for most wells at the site. As indicated in several specific instances earlier in this response, Beazer agrees that several data gaps have been identified and will address them.

GENERAL

d) (Previous SCDHEC Comment #9): According to the Capture Zone Analysis training presented at NARPM in 2004, use of water levels in recovery wells to evaluate capture and hydraulic gradient is not recommended and therefore cannot be approved for the Koppers site. Corrections for well losses are not reliable. Rather, water levels in adjacent wells and piezometers should be used. There appears to be sufficient monitoring wells and piezometers in the intermediate aquifer to estimate the capture zones and hydraulic gradients in the area. For instance, MW-11I can be used to evaluate the drawdown at EW-04I, MW-101 can be used to evaluate the drawdown at EW-02I, CPW-W-1I may be used to evaluate the water levels at EW-03I, MW-109 may be used to evaluate water levels at EW-05I, and PZK-02 may be used to evaluate the drawdown at EW-01R. In the shallow aquifer at the Former Treatment Area, the water level at OW-8s may be used to evaluate drawdown at EW-02s and MW-106 may be used to evaluate the drawdown at EW-09s. Water levels at MW-02s may be used to evaluate the drawdown at EW-12s. PZK-10 water levels may be used to evaluate drawdown at EW-14s. A piezometer may be added inexpensively using direct push technology in other areas where well coverage is not adequate, such as between EW-04s and EW-05s and adjacent to EW-11s. For the shallow aquifer in the Old Impoundment Area, the area around EW-15s and EW-16s may need additional water level monitoring points. A revised capture zone evaluation and hydraulic gradient determination should be made which incorporates these recommendations.

Response 7d: The capture zones interpreted within the reports provided to U.S. EPA and SCDHEC are consistent with the evaluation completed within the pre-design testing at the Site. Specifically, please reference the following reports previously submitted to U.S. EPA and SCDHEC:

- September 1997, Technical Memorandum – Evaluation of Shallow Water Bearing Zone Interim Remedial Actions
- September 1997, Technical Memorandum – Implementation of Scope of Work – Intermediate Water-Bearing Zone NAPL Testing
- April 2000, NAPL/Groundwater Predesign Activities Report
- October 2000, Technical Memorandum: Intermediate Water-Bearing Zone NAPL/Groundwater Activities

Based on these above reports, the capture zone development within the IWBZ and the SWBZ have been well established and are consistent with those utilized in the evaluation of quarterly groundwater monitoring hydraulic data at the Site. For example, in the

IWBZ, testing at EW-01IR at 0.5 and 1.0 gpm groundwater extraction rates was conducted over several days that utilized a number of monitoring wells and piezometers (MW-09I, MW-10I, MW-20I, PZK-01, PZK-02, and PZK-04) and indicated a capture zone of approximately 120 feet downgradient of EW-01IR and 160 feet sidegradient. Similarly, SWBZ capture zones of 80 feet downgradient and 100 to 150 feet sidegradient were observed at a combined flow rate of 2.4 gpm from recovery wells EW-02S through EW-07S.

Note that use of the pumping wells, in conjunction with numerous other monitoring wells/piezometers, in the interpretation of capture zones is technically appropriate and is not uncommon hydrogeological technical professional practice, considering a number of factors including: the size of the Site, subsurface conditions, hydrogeological data/technical reports available, number of monitoring points, other hydrogeological influences (tidal/barometric/NAPL column), etc. Also consider that recovery well installation at the site utilizes large diameter recovery wells with aggressive screen and gravel pack sizing, which, in conjunction with a well developed formation (from several years of operation), ultimately work towards reducing well losses and increasing the pumping well efficiency. Notwithstanding the above, Beazer will use adjacent monitoring points, as available, in the future to evaluate drawdown.

GENERAL

e) The Department is not in agreement that bailing product from wells impacted by several feet of DNAPL is sufficient. A peristaltic pump is also not a viable choice for recovery of viscous DNAPL. Recovery wells with automated pumps are needed to adequately capture the DNAPL at the site. Another coal tar site in the Charleston area has had success with the Blackhawk DNAPL recovery system.

Response 7e: Beazer's DNAPL approach does not solely rely on bailing product from wells. In fact, the remedial approach at this time solely conducts DNAPL recovery using pumps. The Blackhawk DNAPL system is just a different type of pump (jack pump) versus the solenoid activated piston pump currently utilized by Beazer for DNAPL recovery. At a limited number of instances within this response, Beazer recommends performing passive DNAPL recovery as a first step in evaluating the presence of DNAPL within monitoring wells. This data will be indicative of a potential long term DNAPL accumulation trends and will be useful in decision making regarding active DNAPL recovery, if determined necessary.

OIA

f) The responses propose additional characterization work in the vicinity of MW-102A. Please discuss the proposed depth of the soil borings. Contamination has been identified in both the shallow and intermediate aquifers in this area. It is recommended that piezometers in addition to those proposed be installed in the intermediate aquifer in this

area. These additional wells should also be evaluated for water levels and water quality. Furthermore, sediment samples should be collected from the barge canal adjacent to MW-102A to evaluate whether sediment in this area has been impacted by contaminated groundwater. Soil sampling is also recommended should zones of visible contamination be identified within the soil borings.

Response 7f: In addition to the other revisions to the MW-102A area investigation, Beazer also agrees to extend the investigation to the intermediate aquifer.

D H E C

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C. Earl Hunter, Commissioner

Promoting and protecting the health of the public and the environment.

June 21, 2007

Mr. Craig Zeller, P.E.
U.S. Environmental Protection Agency, Region 4
Atlanta Federal Center
61 Forsyth Street, S.W.
Atlanta, GA 30303

RE: Koppers Company
SCD980310239
Response Submittal of Response to Comments
Received March 21, 2007
Charleston County

Dear Mr. Zeller:

The Division of Site Assessment and Remediation has reviewed the above referenced document submitted by Beazer East, Inc. on behalf of the Koppers Company, Inc. Additional comments and requests for clarification should be incorporated into the revised responses.

1. Clarification for responses 1b and 1c: The Department requests that Beazer please provide the data as a time vs. concentration and add it to the maps that were previously provided.

2. Clarification for responses 1d and 1e: The Department requests that the CCW-MW-3I be sampled for the dissolved concentrations since NAPL was previously present in the well. If there is a choice to be made between MW-104 and CCW-MW-3I for which well will be added to the monitoring program, the Department requests that CCW-MW-3I be added and not MW-104.

3. Clarification for response 1f: The Department requests that water level data and analytical data be collected from PZK-02. While the history for the relationship of DNAPL recovery with dissolved phase concentrations in adjacent wells will not be able to be presented, a current account and future samples will let us see the progress that is occurring from this point forward.

4. Clarification for response 1g: The Department requests that Beazer please provide the data as a time vs. concentration and add it to the maps that were previously provided.

5. Clarification for response 1h: If Beazer is certain that CPW-W-1I is not adequately placed to contribute any information regarding the aqueous plume, the Department requests that a monitoring well be installed that will provide the necessary information.

6. Clarification for response 1i; The Department understands that CPW-W-8I and MW-101B are sampled and both have reported non-detects. However, CPW-W-16I has had concentrations in the past and the Department would like to know if this well is needed or if the other two wells have the contaminate migration defined.

7. Clarification for response 3: What kind of sampling schedule is MW-203I on? Additionally the Department would still like to see a time vs. concentration graph.

8. Clarification for response 4: MW-22I should be sampled on a quarterly basis to establish a trend.

GENERAL

9. Clarification for response 5: The Department would like to see an evaluation completed for this system to see if the remediation system is reaching its full potential or not. If the system is found to not be reaching its full potential the evaluation should include other recovery options.

10. Clarification for SWBZ response 6a: Please provide data that supports MW-201S is within the capture zone of EW-16S. Please show the calculations for the capture zone with and without the recovery well input.

11. Clarification for response 6b: In the response it is stated, "this indicates that another recovery well in this location is not productive." Please indicate which other wells besides EW-03I and EW-04I is not productive in recovering DNAPL and why a recovery well near MW-114 is not needed. Additionally, the Department would like clarification for the methods that are being considered for the term "passive recovery testing" as it is meant by Beazer, East, Inc.

Should you have any questions regarding the above, you may contact me at (803) 896-4162 or williacj@dhec.sc.gov.

Sincerely,

Charles J. Williams, III, Project Manager
Federal Remediation Section
Division of Site Assessment and Remediation
Bureau of Land and Waste Management

Paul Bergstrand, P.G., Hydrogeologist
Superfund Section
Division of Hydrogeology
Bureau of Land and Waste Management

cc: Don Siron, Federal Remediation Manager
Michael Slenska, P.E., Beazer East, Inc., One Oxford Ctr., Ste. 3000, Pittsburg, PA 15219-6401
Charleston EQC Office, Region 7 EQC
File #55368

D H E C

PROMOTE PROTECT PROSPER

C. Earl Hunter, Commissioner

Promoting and protecting the health of the public and the environment.

June 21, 2007

Mr. Craig Zeller, P.E.
U.S. Environmental Protection Agency, Region 4
Atlanta Federal Center
61 Forsyth Street, S.W.
Atlanta, GA 30303

RE: Koppers Company
SCD980310239
First Quarter 2007 Operations & Monitoring Report, Dated 26 April 2007
Received May 1, 2007
Charleston County

Dear Mr. Zeller:

The Department has reviewed the referenced document submitted by Field & Technical Services, LLC on behalf of the Beazer East Inc. The document should be revised incorporating the following comments.

1. The document does not appear to be signed and stamped by a South Carolina Professional. The revised document should have the appropriate signature and stamp.

2. The document provides a table of Non Aqueous Phase Liquid (NAPL) thickness but does not appear to have included any maps or figures representing the current extent or thickness of the NAPL or maps or figures showing how the thickness of NAPL has changed over time. The revised document and all future Operations and Monitoring Reports should include the same.

3. The document does not appear to have included any maps or figures representing the current extent dissolved phase contamination or maps or figures showing how the dissolved phase contamination has changed over time. The revised document and all future Operations and Monitoring Reports should include the same.

4. Section 3 Ashley River Monitoring

   This section of the report states that the sub-aqueous cap is being monitored annually and is then compared to the December 2001 baseline survey. The comparison indicates that the cap has a measured thickness of less than 12 inches at locations TM-19 and TM-34 and that channelized erosion is occurring downstream of the rip-rap from Milford Street and central Drainage Ditches. The report also states that the channelized erosion has been noted during previous monitoring events between March 2003 and February 2006.

   Appendix B includes as-built drawings of the subaqueous cap and an air photo of the sample locations. However, there does not appear to be any map or figure representing the current thickness of the subaqueous cap or the location of the channelized erosion.

The revised document should include a figure that represents the current thickness of the subaqueous cap and the channelized erosion.

5. Section 3.2 Ashley River Monitoring-Maintenance Summary

This section of the report states that no maintenance activities were performed and does not appear to indicate that any have been planned. If timely maintenance of caps and erosion features are addressed in the Koppers monitoring plan, the cap maintenance should occur and be followed by a report. If timely maintenance of caps and erosion features are not addressed in the Koppers monitoring plan, Beazer East Inc. should conduct cap maintenance on the current erosion and submit a plan that will propose maintenance response time and reporting.

6. Section 5.3, Data Evaluation

This section contains a discussion of NAPL Recovery Well Efficiency and NAPL Capture Zones. Comments on these sections will be reserved until after a site visit has been conducted.

7. Section 6.0, Groundwater Natural Attenuation Monitoring

This section states that groundwater natural attenuation monitoring, also known as monitored natural attenuation (MNA), consists of quarterly chemical monitoring. Section 6.2, Future Activities, states that the next quarterly natural attenuation performance monitoring event will occur in the second quarter of 2007 with annual chemical monitoring scheduled in the fourth quarter of 2007. The revised report should clarify the type and frequency of groundwater natural attenuation monitoring.

8. Section 6.0, Groundwater Natural Attenuation Monitoring

This section of the report states that the results of the First Quarter 2007 natural attenuation performance monitoring are provided in tables 6-1 through 6-4. The revised document should include an evaluation of the data following a standard data evaluation protocol, such as the Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water (EPA/600/R-98/128), Performance Monitoring of MNA Remedies for VOCs in Ground Water (EPA/600/R-04/027), Designing Monitoring Programs to Effectively Evaluate the Performance of Natural Attenuation (Air Force Center for Environmental Excellence, January 2000), or Strategies for Monitoring the Performance of DNAPL Source Zone Remedies (Interstate Technology & Regulatory Council document DNAPLs-5, August 2004). The combined quarterly data should be evaluated in the fourth quarter or annual report.

9. Tables 6-1

Table 6-1 in the revised document should include a column that lists the contamination standards and bold any detected analytical value that exceeds the standard.

10. Figure 5-1, Figure 5-3

Figure 5-1 and Figure 5-3 does not include a scale. The revised document should include a scale on all appropriate figures.

11. Figures 5-5, 5-6, 5-7 and 5-8

The scale of Figures 5-5, 5-6, 5-7 and 5-8 is 1 inch to 300 feet. This large scale does not allow enough detail. The revised document should use a smaller scale for these figures.

12. Appendix A, 2007 Annual Monitoring Report, Soil and Drainage Ditch Remedial Action

The Executive Summary states that the soil and drainage ditch remedial actions (RA) will continue to be monitored on a monthly basis. There did not appear to be any data or records from the monthly monitoring in this annual report. The revised document should include all pertinent data and records from the monthly monitoring.

13. Appendix A, Section 2.0 Methods

This section states that areas needing maintenance were noted. It is not clear when maintenance will occur, how the maintenance will be documented or when the report of maintenance will be provided. The revised document should address when maintenance will occur, how the maintenance will be documented and when the maintenance will be reported.

14. Appendix B, 2007 Annual Monitoring Report, Ashley River Subaqueous Cap RA

The Executive Summary states that exposed geo-textile fabric was observed near monitoring locations TM-32 and TM-34. Section 4.0, Summary and Recommendations, state that the 2008 Annual Monitoring Report will contain a maintenance and repair scheme for this location. The areas of exposed fabric should be repaired immediately and the repair report should be submitted independent of the revised document.

Page iv: The Department agrees with the plan to the design of a maintenance and repair plan for the sub-aqueous cap for monitoring locations TM-30, TM-31, TM-32, TM-33, TM-34, TM-37, and TM-38. However, the Department also thinks that the evaluation process should also look at monitoring location TM-19.

The cap thickness at location TM-19 decreased 2.5 inches in the last year and on average of 1.5 inches per year since 2001. At these rates the cap would be gone in 4 to 6 years at this location. Since a remedy is already being looked at for this problem in another location, TM-19 should be added to the current study in an effort to remain proactive.

15. Appendix B, Figures

The document does not appear to include an isocontour map of the current thickness of the subaqueous cap. The revised document should include an isocontour map that represents the current thickness of the subaqueous cap.

Should you have any questions regarding the above, you may contact me at (803) 896-4162 or williacj@dhec.sc.gov.

Sincerely,

Charles J. Williams, III, Project Manager
Federal Remediation Section
Division of Site Assessment and Remediation
Bureau of Land and Waste Management

Paul Bergstrand, P.G., Hydrogeologist
Superfund Section
Division of Hydrogeology
Bureau of Land and Waste Management

cc: Don Siron, Federal Remediation Manager
Michael Slenska, P.E., Beazer East, Inc., One Oxford Ctr., Ste. 3000, Pittsburg, PA 15219-6401
Charleston EQC Office, Region 7 EQC
File #55368

D H E C

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C. Earl Hunter, Commissioner

Promoting and protecting the health of the public and the environment.

June 21, 2007

Mr. Craig Zeller, P.E.
U.S. Environmental Protection Agency, Region 4
Atlanta Federal Center
61 Forsyth Street, S.W.
Atlanta, GA 30303

RE: Koppers Company
SCD980310239
Meeting Summary and Responses to Comments/Correspondence on the Performance Evaluation Report
Received September 6, 2007
Charleston County

~~Dear Mr. Zeller:~~

The Department has reviewed the document submitted by Beazer East, Inc. on behalf of the Koppers Company, Inc and agrees with the responses and the modifications to be completed.

Should you have any questions regarding the above, you may contact me at (803) 896-4162, williacj@dhec.sc.gov or Paul Bergstrand at (803) 896-4016 or bergstpm@dhec.sc.gov.

Sincerely,

Charles J. Williams, III, Project Manager
Federal Remediation Section
Division of Site Assessment and Remediation
Bureau of Land and Waste Management

Paul Bergstrand, P.G., Hydrogeologist
Superfund Section
Division of Hydrogeology
Bureau of Land and Waste Management

cc: Don Siron, Federal Remediation Manager
Michael Slenska, P.E., Beazer East, Inc., Onc Oxford Ctr., Ste. 3000, Pittsburg, PA 15219-6401
Charleston EQC Office, Region 7 EQC
File #55368

Beazer

BEAZER EAST, INC. C/O THREE RIVERS MANAGEMENT, INC.
ONE OXFORD CENTRE, SUITE 3000, PITTSBURGH, PA 15219-6401

September 4, 2007

Mr. Craig Zeller, P.E.
U.S. Environmental Protection Agency, Region 4
Atlanta Federal Center
61 Forsyth Street, S.W.
Atlanta, GA 30303

Re: Meeting Summary and Responses to Comments/Correspondence on the Performance Evaluation Report
Former Koppers Company, Inc. Superfund Site
Charleston, South Carolina

Dear Mr. Zeller:

Beazer East, Inc. (Beazer) hereby provides the U.S. Environmental Protection Agency (U.S. EPA) with this summary of discussion items from the July 9, 2007 Site walk and meeting regarding the Performance Evaluation Report[1] and subsequent comment/response correspondence. Attachment 1 presents the topics discussed at the meeting, and combines all written comments and comment responses subsequent to the Performance Evaluation Report in one document.

If you should have any comments or questions regarding this submittal please contact me at (412) 208-8867 or mike.slenska@hanson.biz.

Sincerely,

Michael Slenska, P.E.
Environmental Manager

Attachments

cc: Charles J. Williams, III – SCDHEC
Paul Bergstrand, P.G. - SCDHEC
Neale Misquitta – KEY

[1] January 24, 2006, *Performance Evaluation Report*, Former Koppers Company, Inc. Superfund Site, Charleston, South Carolina, prepared for Beazer East, Inc., prepared by Key Environmental, Inc., submitted to U.S. EPA and SCDHEC.

D H E C

PROMOTE PROTECT PROSPER

C. Earl Hunter, Commissioner

Promoting and protecting the health of the public and the environment.

June 21, 2007

Mr. Craig Zeller, P.E.
U.S. Environmental Protection Agency, Region 4
Atlanta Federal Center
61 Forsyth Street, S.W.
Atlanta, GA 30303

RE: Koppers Company
SCD980310239
Meeting Summary and Responses to Comments/Correspondence on the Performance Evaluation Report
Received September 6, 2007
Charleston County

Dear Mr. Zeller:

The Department has reviewed the document submitted by Beazer East, Inc. on behalf of the Koppers Company, Inc and agrees with the responses and the modifications to be completed.

Should you have any questions regarding the above, you may contact me at (803) 896-4162, williacj@dhec.sc.gov or Paul Bergstrand at (803) 896-4016 or bergstpm@dhec.sc.gov.

Sincerely,

Charles J. Williams, III, Project Manager
Federal Remediation Section
Division of Site Assessment and Remediation
Bureau of Land and Waste Management

Paul Bergstrand, P.G., Hydrogeologist
Superfund Section
Division of Hydrogeology
Bureau of Land and Waste Management

cc: Don Siron, Federal Remediation Manager
Michael Slenska, P.E., Beazer East, Inc., Onc Oxford Ctr., Ste. 3000, Pittsburg, PA 15219-6401
Charleston EQC Office, Region 7 EQC
File #55368

Beazer

BEAZER EAST, INC. C/O THREE RIVERS MANAGEMENT, INC.
ONE OXFORD CENTRE, SUITE 3000, PITTSBURGH, PA 15219-6401

September 4, 2007

Mr. Craig Zeller, P.E.
U.S. Environmental Protection Agency, Region 4
Atlanta Federal Center
61 Forsyth Street, S.W.
Atlanta, GA 30303

Re: Meeting Summary and Responses to Comments/Correspondence on the Performance Evaluation Report
Former Koppers Company, Inc. Superfund Site
Charleston, South Carolina

Dear Mr. Zeller:

Beazer East, Inc. (Beazer) hereby provides the U.S. Environmental Protection Agency (U.S. EPA) with this summary of discussion items from the July 9, 2007 Site walk and meeting regarding the Performance Evaluation Report[1] and subsequent comment/response correspondence. Attachment 1 presents the topics discussed at the meeting, and combines all written comments and comment responses subsequent to the Performance Evaluation Report in one document.

If you should have any comments or questions regarding this submittal please contact me at (412) 208-8867 or mike.slenska@hanson.biz.

Sincerely,

Michael Slenska, P.E.
Environmental Manager

Attachments

cc: Charles J. Williams, III – SCDHEC
Paul Bergstrand, P.G. - SCDHEC
Neale Misquitta – KEY

[1] January 24, 2006, *Performance Evaluation Report*, Former Koppers Company, Inc. Superfund Site, Charleston, South Carolina, prepared for Beazer East, Inc., prepared by Key Environmental, Inc., submitted to U.S. EPA and SCDHEC.

Attachment 1
Responses to Comments
Performance Evaluation Report & Subsequent Correspondence
Former Koppers Company, Inc. Superfund Site – SCD 980 310 239
September 4, 2007

On behalf of Beazer East, Inc. (Beazer), Key Environmental, Inc. (KEY) has prepared responses to the South Carolina Department of Health and Environmental Control (SCDHEC) correspondences dated June 21, 2007[2,3] regarding the Performance Evaluation Report[4]. In addition, this submittal also addresses previous U.S EPA and SCDHEC comments[5,6] and discussions conducted during the July 9, 2007 meeting in Charleston, SC between U.S. EPA, SCDHEC, and Beazer (July 9, 2007 meeting). In order to make this document inclusive of all related correspondence, these responses are organized into topical sections. All comments from the referenced correspondences are addressed in the sections identified herein.

1.1 Old Impoundment Area Investigation

Attachment 1A presents the scope of work for the Old Impoundment Area (OIA) Investigation, including the original scope presented in the response to comments (Beazer, June 29, 2006) and additional agreed-upon investigatory tasks as documented in subsequent responses (Beazer, March 20, 2007) and the July 9, 2007 meeting.

1.2 Former Treatment Area Investigation

In response to comments, additional investigatory work in the Former Treatment Area (FTA) will be conducted in the vicinities of monitoring wells MW-12S and MW-100B. Additional piezometers/wells will be installed in the FTA, as follows. One piezometer will be installed to the south of MW-12S to support the evaluation of NAPL containment and restoration of the aqueous phase in this area. A monitoring well will be installed to the south of MW-100B to define the plume boundary in this area. Installation of the piezometer to the south of MW-12S will be installed upon obtaining access to this area.

1.3 Additional NAPL Recovery

In the response to comments and as discussed at the July 9, 2007 meeting, Beazer agrees to perform additional recovery of non-aqueous phase liquid (NAPL) at a number of locations identified below. Specific action items are as follows:

---

[2] June 21, 2007, SCDHEC, *Response to Submittal of Response to Comments Received March 21, 2007*, provided to U.S. EPA.
[3] June 21, 2007, SCDHEC, *First Quarter 2007 Operations & Monitoring Report, Dated 26 April 2007, Received May 1, 2007*, provided to U.S. EPA.
[4] January 24, 2006, *Performance Evaluation Report*, Former Koppers Company, Inc. Superfund Site, Charleston, South Carolina, prepared for Beazer East, Inc., prepared by Key Environmental, Inc., submitted to U.S. EPA and SCDHEC.
[5] June 29, 2006, Beazer, *Responses to Comments, GW/DNAPL – Performance Evaluation Report*, provided to U.S. EPA and SCDHEC.
[6] March 20, 2007, Beazer, *Submittal of Responses to Comments*, provided to U.S. EPA and SCDHEC.

- Monthly passive NAPL recovery will be conducted at the following locations for a one-year period: MW-114, MW-107, MW-12S, and MW-108. Specifically, NAPL will be removed from the identified wells when two feet or more of NAPL is measured. Following this one-year period, recommendations will be made to U.S. EPA and SCDHEC regarding future (passive or active) NAPL recovery at these locations; and,

- Passive recovery techniques shall include bailing product as well as alternative passive recovery techniques such as absorbent socks.

1.4 Modifications to the Existing NAPL Recovery System

The following modification shall be made to the current NAPL recovery system in response to comments and discussions during the July 9, 2007 meeting:

- The pumping rate at production well EW-3I will be decreased for a three month period. If this measure fails to increase production of NAPL, the well will be shut off and periodically turned back on to monitor for efficiency. If improved recovery is not observed within one year, additional recommendations will be made to U.S. EPA and SCDHEC regarding discontinuing NAPL recovery from this well.

1.5 Sampling and Analysis

In response to comments, the following wells will be added to the current groundwater monitoring program as defined by the Comprehensive Environmental Monitoring Plan[7] (CEMP) for a one-year period:

- MW-103B
- CCW-MW-3I
- PZK-02
- OW-8S
- OW-5S
- CPW-W-1I
- CPW-W-16I

Additionally, it was agreed at the July 9, 2007 meeting that the current groundwater monitoring program would be revised to reflect the following changes:

[7]Key Environmental, Inc., Comprehensive Environmental Monitoring Plan, prepared on behalf of Beazer East, Inc., April 2004.

- Monitoring will be conducted semiannually for the parameters benzene, toluene, ethylbenzene, and total xylenes (BTEX) and polycyclic aromatic hydrocarbons (PAHs); and,

- Monitoring will be conducted annually for the monitored natural attenuation parameters.

Monitoring dates will be communicated in advance to U.S. EPA and SCDHEC in the Quarterly Progress Reports. The months selected to conduct the monitoring will vary to provide seasonal coverage.

Additionally, Beazer agrees that the critical hydraulic gradient required to mobilize NAPL is a function of the physical properties of the NAPL. Therefore, Beazer agrees to collect samples of NAPL from the SWBZ and IWBZ in both the FTA and OIA. These samples will be tested for interfacial tension between the NAPL and groundwater, contact angle between the NAPL and soil, viscosity, and specific gravity. This information, along with the estimated NAPL pool length of 80 feet, will be used in the model to recalculate the critical hydraulic gradients and to determine/verify NAPL capture. In addition, a sensitivity analysis will be performed to determine the effects of varying NAPL pool lengths on the critical hydraulic gradient required to mobilize NAPL. The following test methods will be used:

Interfacial Tension Measurements	ASTM D971
Contact Angle	ASTM D5946
Specific Gravity	ASTM D1298
Viscosity	ASTM D445

1.6 Reporting

In response to comments, reports of the operations and maintenance (O&M) activities shall be revised to include additional data evaluation, as follows:

- Time versus concentration graphs will be presented for individual wells included in the analytical monitoring program;

- Data evaluations (similar to the two-year report) as per current technical guidance will be included in the annual reports;

- NAPL thickness versus time evaluations will be added to the reports for the following wells, at a minimum: MW-12S, MW-105, MW-102A, EW-04I, MW-202, MW-201S, MW-1S, MW-111R, MW-01SR, MW-110R, and CCC-MW-3I; and,

- For future evaluations of capture zones, NAPL measurements from wells adjacent to recovery wells will be used, as available.

The reporting schedule will be revised as follows:

- Quarterly status reports will continue to be submitted by Beazer to U.S. EPA and SCDHEC; and,
- Results of the groundwater monitoring and O&M activities will be submitted annually.

1.7 June 21, 2007 Response Submittal of Response to Comments

Attachment 1B includes responses to SCDHEC's *Response Submittal of Response to Comments*, dated June 21, 2007.

1.8 June 21, 2007 First Quarter 2007 O&M Report

U.S. EPA, SCDHEC, and Beazer agreed at the July 9, 2007 meeting to amend the reporting for the O&M activities to include the items requested in this correspondence. These items shall be included in subsequent annual reports.

Attachment 1A
Old Impoundment Area Investigation
Former Koppers Company, Inc. Superfund Site – SCD 980 310 239
September 4, 2007

The investigation described in this section originally appeared in responses to comments (Beazer, June 29, 2006 and Beazer, March 20, 2007). This document combines the agreed upon scope of work.

Background

It appears that operation of the Shallow Water Bearing Zone (SWBZ) NAPL recovery system may be contributing to the increase in constituent concentrations observed in MW-102A. Other factors may also be contributing to this change as well. During the summer of 2003, remedial activities associated with the Braswell Street storm sewer were performed in this area. These activities included pressure grouting around the storm sewer to minimize migration of NAPL along the pipe bedding. These remedial activities, coupled with operation of the NAPL recovery system, may be contributing to changing groundwater flow conditions in the OIA. Therefore, Beazer proposes to perform additional field investigation activities to further characterize the nature of groundwater flow in the OIA and extent of groundwater impacts. Field activities will include the following:

- Soil Borings: Approximately twelve (12) soil borings will be completed in the vicinity of MW-102A and within the OIA to further characterize the subsurface geologic conditions that may be contributing to groundwater migration. Figure 1 shows the location of proposed soil borings.

- Piezometers: Six (6) piezometer locations will be installed in the SWBZ and IWBZ of the OIA, for a total of twelve (12) piezometers. Piezometers will be located in the vicinity of MW-102A, near the Braswell Street storm sewer, and within the OIA to further characterize groundwater flow in the region near MW-102A and downgradient of the NAPL recovery system. Piezometers will also be installed in the area upgradient of MW-201S and in the area upgradient of EW-15S. Figure 1 shows the location of the proposed piezometers.

- Hydraulic Monitoring/Groundwater Sampling: Water levels in the SWBZ and IWBZ will be recorded in all newly installed piezometers as well as in the existing monitoring well network including MW-102A, MW-103A, PZ-200, PZ-201, and MW-201S. This information will be used to more clearly quantify groundwater flow characteristics in the OIA. In addition, for a period of one year, groundwater samples will be collected from the twelve (12) piezometers as well as the existing monitoring well network listed above. Samples will be analyzed for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) using methods consistent with the Comprehensive Environmental Monitoring Plan (CEMP).

Reporting: Following collection of this field data, Beazer will prepare a letter report for submission to USEPA and SCDHEC to present the results of the field evaluation and to make recommendations for further investigative and/or remedial activities.

Attachment 1B
Submittal - Response to Comments
Former Koppers Company, Inc. Superfund Site – SCD 980 310 239
September 4, 2007

On behalf of Beazer East, Inc. (Beazer), Key Environmental, Inc. (KEY) has prepared responses to D.H.E.C. (Department of Health & Environmental Control) Response Submittal of Response to Comments. D.H.E.C. comments were provided in a letter dated June 21, 2007 from Charles J. Williams & Paul Bergstrand, to Craig Zeller. Each D.H.E.C. comment is listed in *italics*, followed by the respective Beazer response thereto.

SCDHEC Comment 1: *Clarification for responses 1b and 1c: the Department requests that Beazer please proved the data as a time vs. concentration and add it to the maps that were previously provided.*

KEY Response 1: This comment is addressed in Section 1.6. Time versus concentration graphs will be provided in the annual reports for all wells included in the analytical monitoring program.

SCDHEC Comment 2: *Clarification for responses 1d and 1e: The Department requests that the CCW-MW-3I be sampled for the dissolved concentrations since NAPL was previously present in the well. If there is a choice to be made between MW-104 and CCW-MW-3I for which well will be added to the monitoring program, the Department requests that CCW-MW-3I be added and not MW-104.*

KEY Response 2: This comment is addressed in Section 1.5. Monitoring well CCW-MW-3I has been added to the program.

SCDHEC Comment 3: *Clarification for response 1f: The Department requests that water level data and analytical data be collected from PZK-02. While the history for the relationship of DNAPL recovery with dissolved phase concentrations in adjacent wells will not be able to be presented, a current account and future samples will let us see the progress that is occurring from this point forward.*

KEY Response 3: This comment has been addressed in Section 1.5.

SCDHEC Comment 4: *Clarification for response 1g: The Department requests that Beazer please provide the data as a time vs. concentration and add it to the maps that were previously provided.*

KEY Response 4: This comment has been addressed in Section 1.6.

SCDHEC Comment 5: *Clarification for response 1h: If Beazer is certain that CPW-W-1I is not adequately placed to contribute any information regarding the aqueous plume, the Department requests that a monitoring well be installed that will provide the necessary information.*

KEY Response 5: This comment is addressed in Section 1.5. Beazer will add this well to the program and make a determination as to the value of the data.

SCDHEC Comment 6: *Clarification for response 1i: The Department understands that CPW-W-8I and MW-101B are sampled and both have reported non-detects. However, CPW-W-16I has had concentrations in the past and the Department would like to know if this well is needed or if the other two wells have the contaminate migration defined.*

KEY Response 6: This comment is addressed in Section 1.5. Beazer will add this well to the program and make a determination as to the value of the data.

SCDHEC Comment 7: *Clarification for response 3: If. What kind of sampling schedule is MW-203I on? Additionally, the Department would still like to see a time vs. concentration graph.*

KEY Response 7: Monitoring well MW-203I is currently on a quarterly monitoring schedule for chemical analytical data. The graphs will be provided in the annual reports as stated in Section 1.6.

SCDHEC Comment 8: *Clarification for response 4: MW-22I should be sampled on a quarterly basis to establish a trend.*

KEY Response 8: As provided in Sections 1.5 and 1.6, this well will be sampled on a semiannual basis.

GENERAL

SCDHEC Comment 9: *Clarification for response 5: The Department would like to see an evaluation completed for this system to see if the remediation system is reaching its full potential or not. If the system is found to not be reaching its full potential the evaluation should include other recovery options.*

KEY Response 9: Sections 1.3 and 1.4 address this comment. A written evaluation and recommendations will be submitted after one year of implementing the proposed scope of work.

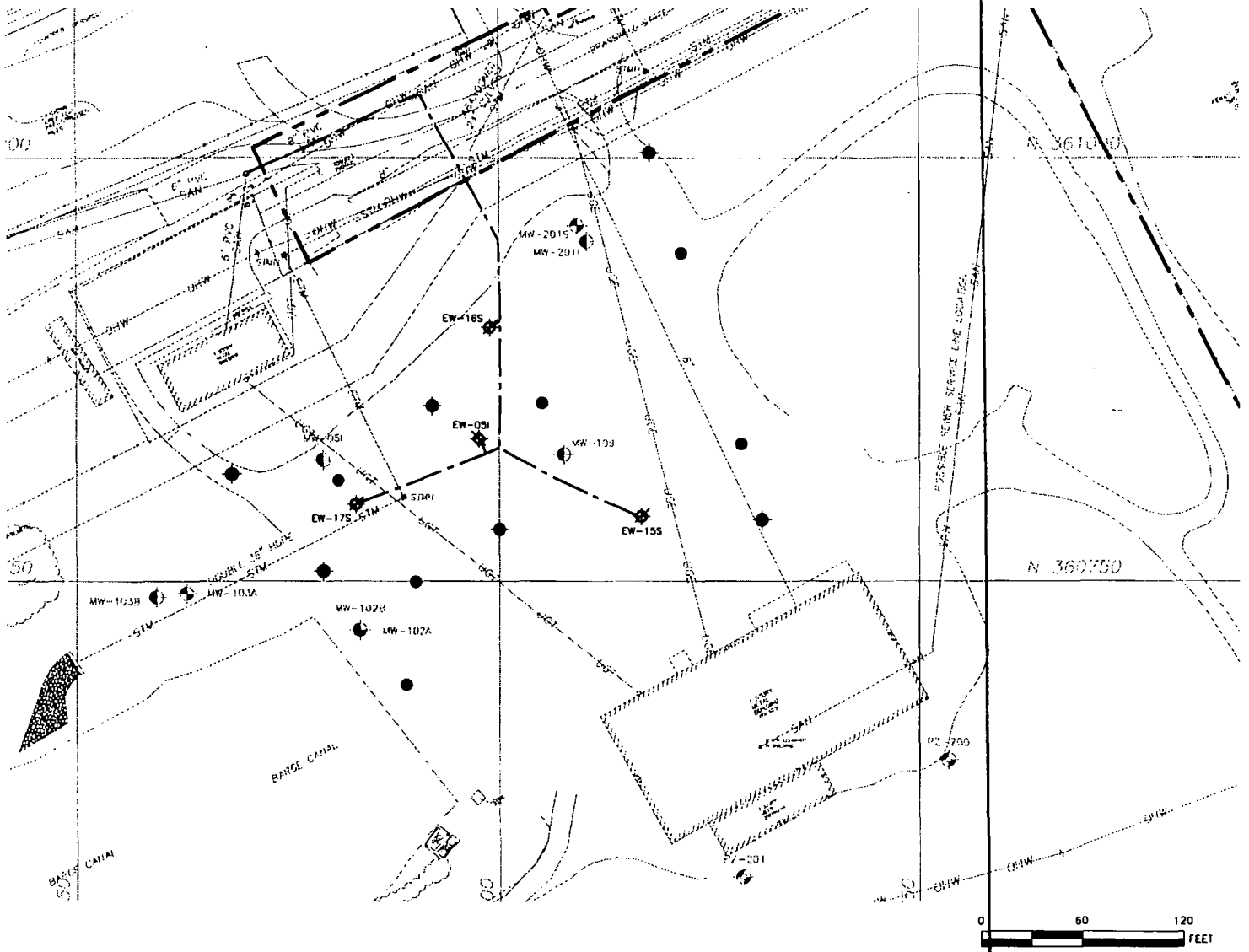
SCDHEC Comment 10: *Clarification for SWBZ response 6a: Please provide data that supports MW-201S is within the capture zone of EW-16S. Please show the calculations for the capture zone with and without the recovery well input.*

KEY Response 10: This comment shall be addressed with the results of the OIA investigation described in Section 1.1.

SCDHEC Comment 11: *Clarification for response 6b: In the response it is stated, "this indicates that another recovery well in this location is not productive." Please indicate which other wells besides EW-03I and EW-04I is not productive in recovering DNAPL and why a recovery well near MW-114 is not needed. Additionally, the Department would like clarification for the methods that are being considered for the term "passive recovery testing" as it is meant by Beazer, East, Inc.*

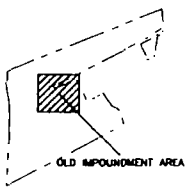
KEY Response 11: The wording of the text was meant to communicate that another recovery well added to this location would not be productive. Beazer intends to use techniques including bailing as well as more innovative passive recovery techniques such as absorbent socks, as discussed in Section 1.3.

OLD IMPOUNDMENT AREA



LEGEND

- SITE BOUNDARY
- EXISTING STRUCTURES
- EDGE OF BARGE CANAL
- FENCE
- POWER LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- WATER LINE
- UNDERGROUND ELECTRIC
- FIRE WATER LINE
- LIGHT POLE
- FIRE HYDRANT
- GAS METER
- STORM SEWER INLET/ MANHOLE
- MW-102A/102B — NESTED SWBZ AND IWBZ MONITORING WELL LOCATION
- MW-05I — SWBZ MONITORING WELL LOCATION
- MW-19I — IWBZ MONITORING WELL LOCATION
- PZ-200 — PIEZOMETER LOCATION
- EW-08S — AS-BUILT SWBZ NAPL RECOVERY WELL LOCATION
- EW-03 — AS-BUILT IWBZ NAPL RECOVERY WELL LOCATION
- AS-BUILT GROUNDWATER DISCHARGE PIPE
- PROPOSED SOIL BORING LOCATION (APPROXIMATE)
- PROPOSED SOIL BORING/PIEZOMETER LOCATION-SWBZ & IWBZ



LOCATION KEY

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: CRJ	DATE: 08/09/07
CHKD: KDF	DATE: 08/09/07
APPD: RJM	DATE: 08/09/07
SCALE: AS SHOWN	

KEY ENVIRONMENTAL, INCORPORATED

ATTACHMENT 1A-RESPONSES TO COMMENTS
PERFORMANCE EVALUATION REPORT
FORMER KOPPERS COMPANY, INC. SITE
CHARLESTON, SOUTH CAROLINA

SOIL BORING/PIEZOMETER LOCATION MAP

PROJECT NO: 07-486

FIGURE 1

REV. #	DATE	DESCRIPTION	APPD
1			
2			
3			

REFERENCE: TOPOGRAPHIC SURVEY AND PLANIMETRICS PROVIDED BY:
- DAMES & MOORE, INC., 1998.
- DAVIS & FLOYD, INC., 2001.

ISSUE DATE:

KEY ENVIRONMENTAL, INC.
300 THIRD AVENUE
CHARLESTON, SC 29406

D H E C
PROMOTE PROTECT PROSPER

C. Earl Hunter, Commissioner
Promoting and protecting the health of the public and the environment.

28 November 2007

Mr. Tom Jordan, P.G.
Key Environmental, Inc.
200 Third Avenue
Carnegie, PA 15106

Koppers Site
Charleston, South Carolina
SCD 980 310 239

Monitoring Well Installation Request (Jordan to Bergstrand)
Old Impound Area and the Former Treatment Area (OIA & FTA)
Revision 0, Dated 26 November 2007

Dear Mr. Jordan:

The referenced request has been reviewed and approved with respect to R.61-71 of the South Carolina Well Standards. This request is to install two (2) permanent monitoring wells in the FTA and twelve (12) permanent monitoring wells in the OIA. The well installation is planned for the week of 10 December 2007.

Attached, please find the Permanent Monitoring Well Approval #SF-07-131 and figures representing the approved monitoring well locations. All well installation derived wastes must be managed properly and in accordance with all applicable state and federal requirements. The well installation report (R.61-71.H.1.f) shall be submitted to my attention within 30 days after well completion.

Please provide a minimum of 48 hours prior notice before the initiation of well installation activities to the author at 803.896.4016.

SF070802.PMB
File Number 051717

The Department well approval does not imply or guarantee that the well locations are appropriate for the purpose intended. After reviewing the report of results the Department may determine that additional monitoring wells are necessary. Should there be any questions, please contact me by e-mail at bergstpm@dhec.sc.gov or at 803.896.4016.

Respectfully,

Paul M. Bergstrand, P.G. Hydrogeologist
Superfund Groundwater Section
Division of Hydrogeology
Bureau of Land and Waste Management

Enclosures

CC:
Christine Sanford-Coker, Region 7 EQC, Charleston, SC
Chuck Williams, BLWM
Craig Zeller, USEPA Region 4, Atlanta Federal Center, 61 Forsyth St. S.W., Atlanta GA 30303
Kenan Transport Company, 81 Braswell Street, North Charleston, SC 29405
Beazer East, Inc. One Oxford Centre, Suite 3000, Pittsburgh, PA 15219-6401
File 051717

D H E C

PROMOTE PROTECT PROSPER

C. Earl Hunter, Commissioner

Promoting and protecting the health of the public and the environment.

Permanent Monitoring Well Installation Approval

Approval is hereby granted to: Mr. Tom Jordan, P.G., Key Environmental, Inc., 200 Third Avenue, Carnegie, PA 15106

Facility: Koppers Site, Braswell Street, Charleston, South Carolina
SCD 980 310 239

This approval is for the installation of fourteen (14) permanent monitoring wells. The monitoring wells are to be installed in the locations shown on Figures 2, 4 & 5 and according to the construction details provided in the 4 September 2007 correspondence (Slenska to Zeller). These monitoring wells are to be installed following all applicable requirements of R.61-71.

Please note that R.61-71 requires the following:

1. All wells shall be drilled, constructed, and abandoned by a South Carolina certified well driller as required by R.61-71.D.1.

2. If any of the information provided to the Department changes, the Author (803.896.4016) shall be notified a minimum of twenty-four hours prior to well construction as required by R.61-71.H.1.a.

3. A Water Well Record Form or other form provided or approved by the Department shall be completed and submitted within 30 days after well completion. The form should contain the "as-built" construction details and all other information as required by R.61-71.H.1.f

4. All wells shall be labeled as required by R.61-71.H.2.c.

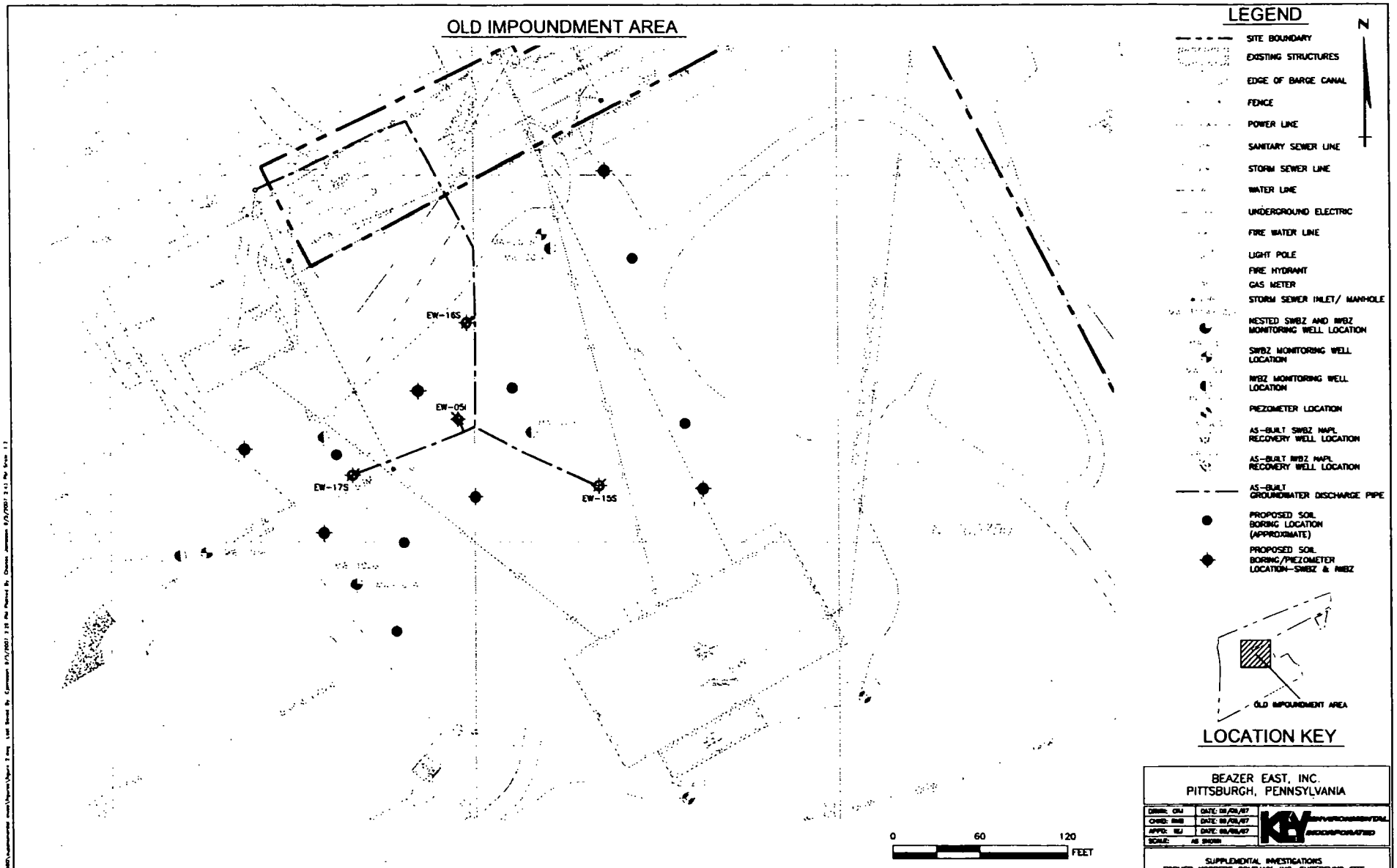
5. All wells shall be properly developed as required by R.61-71.H.2.d.

This approval is pursuant to the provisions of Section 44-55-40 of the 1976 South Carolina Code of Laws and R.61-71 of the South Carolina Well Standards dated April 26, 2002.

Date of Issuance: 27 November 2007 **Approval #: SF-07-131**

Paul M. Bergstrand, P.G.
Superfund Groundwater Section
Division of Hydrogeology
Bureau of Land and Waste Management

SF070802.PMB
File Number 051717



LEGEND

- SITE BOUNDARY
- EXISTING STRUCTURES
- EDGE OF BARGE CANAL
- FENCE
- POWER LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
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- FIRE WATER LINE
- LIGHT POLE
- FIRE HYDRANT
- GAS METER
- STORM SEWER INLET/ MANHOLE
- NESTED SWBZ AND RWBZ MONITORING WELL LOCATION
- SWBZ MONITORING WELL LOCATION
- RWBZ MONITORING WELL LOCATION
- PIEZOMETER LOCATION
- AS-BUILT SWBZ NAPL RECOVERY WELL LOCATION
- AS-BUILT RWBZ NAPL RECOVERY WELL LOCATION
- AS-BUILT GROUNDWATER DISCHARGE PIPE
- PROPOSED SOIL BORING LOCATION (APPROXIMATE)
- PROPOSED SOIL BORING/PIEZOMETER LOCATION-SWBZ & RWBZ

N

LOCATION KEY

REV #	DATE	DESCRIPTION	APPD
1			
2			
3			

REFERENCE: TOPOGRAPHIC SURVEY AND PLANIMETRICS PROVIDED BY:
- DAMES & MOORE, INC., 1988.
- DAVIS & FLOYD, INC., 2001.

ISSUE DATE:

KEY ENVIRONMENTAL, INC.
300 SIXTH AVENUE
CHARLESTON, WV 25302

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: CRJ	DATE: 08/28/07
CHKD: RMB	DATE: 08/28/07
APPD: WJ	DATE: 08/28/07
SCALE: AS SHOWN	

KEY ENVIRONMENTAL, INCORPORATED

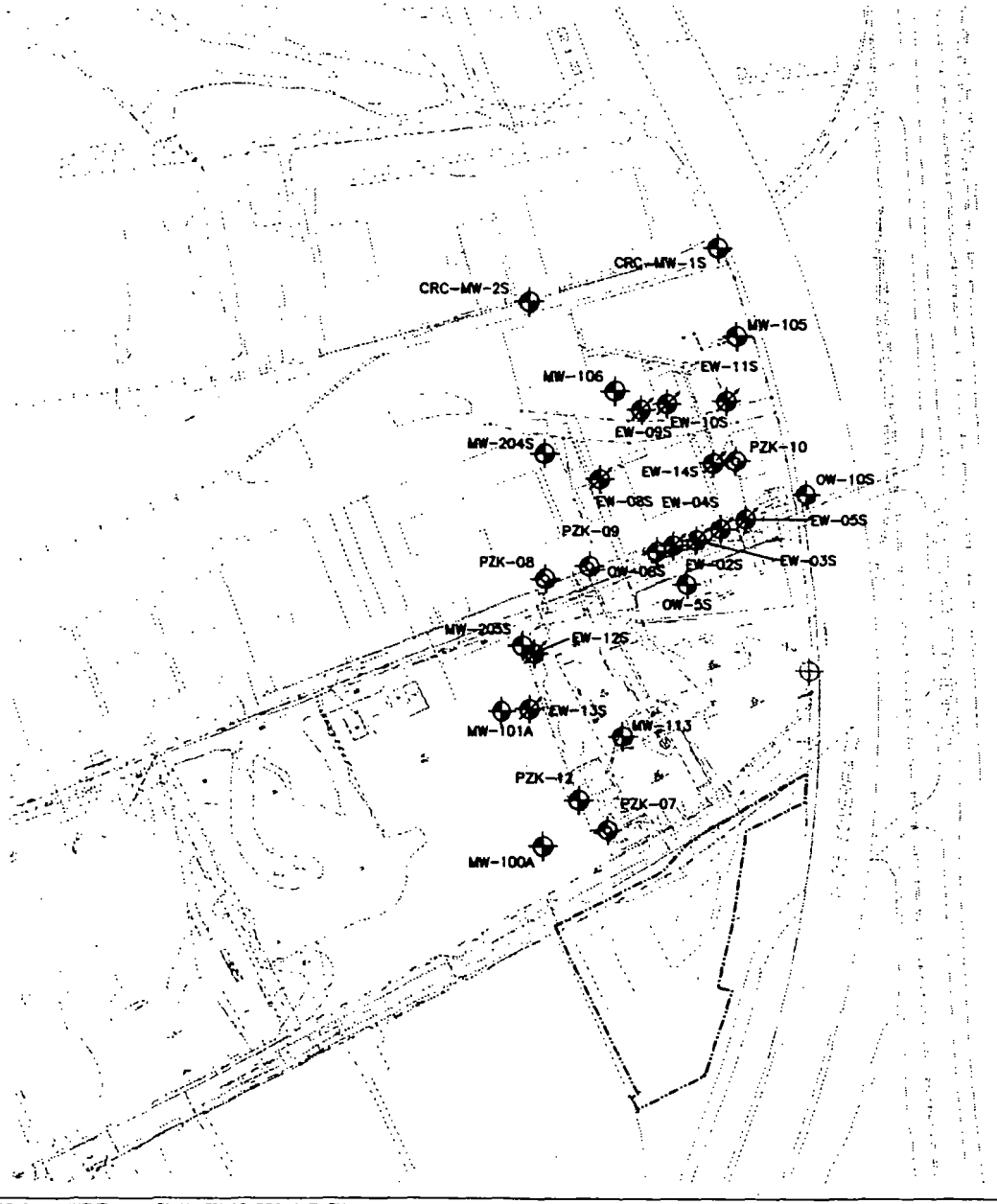
SUPPLEMENTAL INVESTIGATIONS
FORMER KOPPERS COMPANY, INC. SUPERFUND SITE
CHARLESTON, SOUTH CAROLINA

SOIL BORING/PIEZOMETER LOCATION MAP

PROJECT NO. 07-460

FIGURE 2

FORMER TREATMENT AREA (01/08/07)



N

LEGEND

- ADDITIONAL NAPL RECOVERY LOCATION
- PROPOSED PIEZOMETER LOCATION
- PIEZOMETER LOCATION
- MONITORING WELL LOCATION
- EXTRACTION WELL LOCATION
- SITE BOUNDARY
- EXISTING STRUCTURES
- EDGE OF BARGE CANAL
- FENCE

0 300 600 FEET

REFERENCE: TOPOGRAPHIC SURVEY AND PLANIMETRICS PROVIDED BY:
- DAMES & MOORE, INC., 1999.
- DAVIS & FLOYD, INC., 2001.

ISSUE DATE:

KEY ENVIRONMENTAL, INC.
209 THIRD AVENUE
CARNEGIE, PA 15106

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: WAA	DATE: 08/22/07	KEY ENVIRONMENTAL INCORPORATED
CHKD: TEJ	DATE: 08/22/07	
APPD: TEJ	DATE: 08/22/07	
SCALE: AS SHOWN		

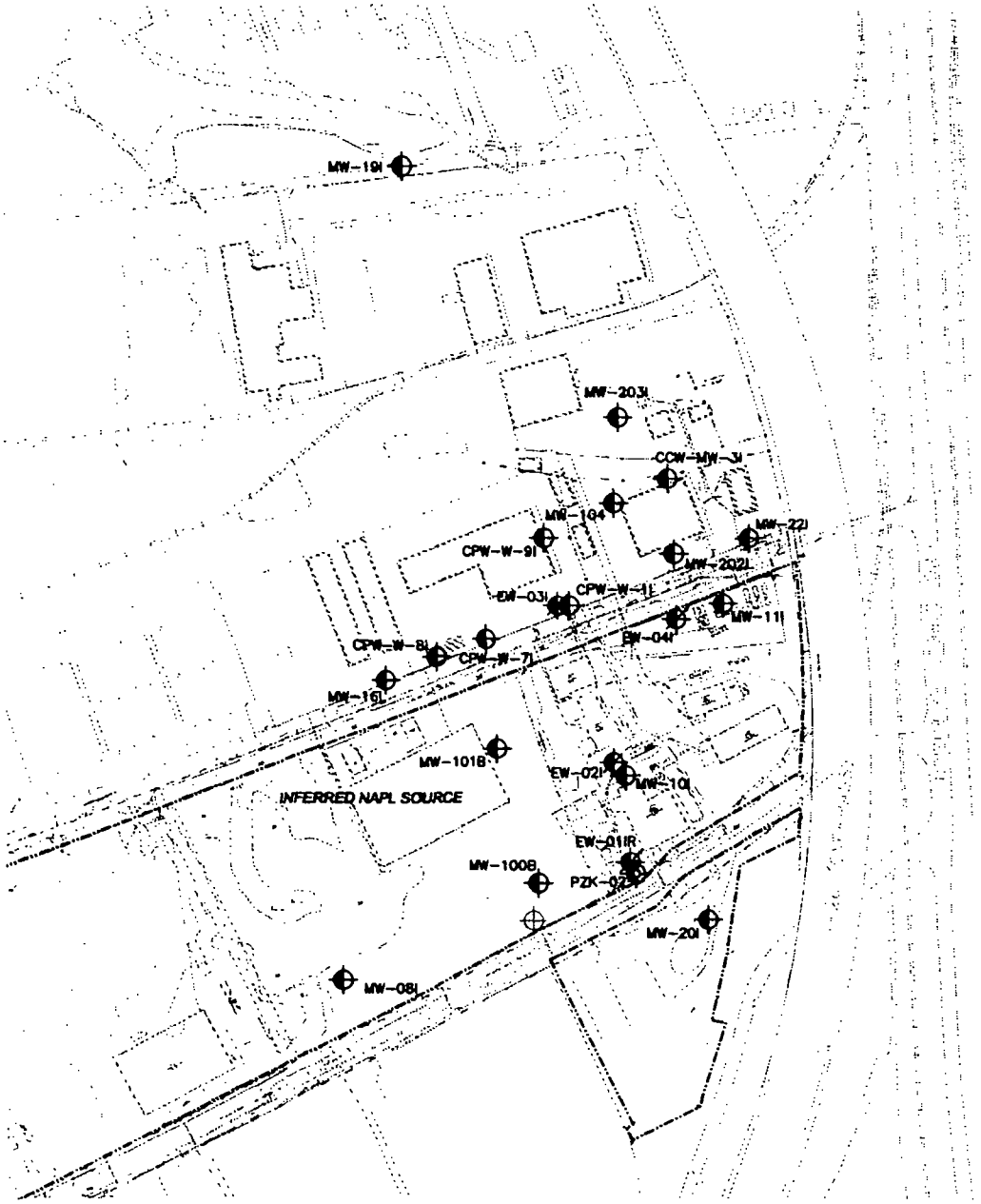
FORMER KOPPERS COMPANY, INC. SITE
CHARLESTON, SOUTH CAROLINA

PROPOSED SWPZ MONITORING WELL AND ADDITIONAL NAPL RECOVERY LOCATION

PROJECT NO: 07-480

FIGURE 4

FORMER TREATMENT AREA (01/08/07)



N

LEGEND

- NAPL RECOVERY MODIFICATION LOCATION (EW-03I)
- ADDITIONAL NAPL RECOVERY LOCATION
- PROPOSED PIEZOMETER LOCATION
- PIEZOMETER LOCATION
- MONITORING WELL LOCATION
- EXTRACTION WELL LOCATION
- SITE BOUNDARY
- EXISTING STRUCTURES
- EDGE OF BARGE CANAL
- FENCE

0 300 600 FEET

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: WAA	DATE: 08/22/07	KEY ENVIRONMENTAL INCORPORATED
CHKD: TEJ	DATE: 08/22/07	
APPD: TEJ	DATE: 08/23/07	
SCALE: AS SHOWN		

SUPPLEMENTAL INVESTIGATIONS
FORMER KOPPERS COMPANY, INC. SITE
CHARLESTON, SOUTH CAROLINA

REFERENCE:

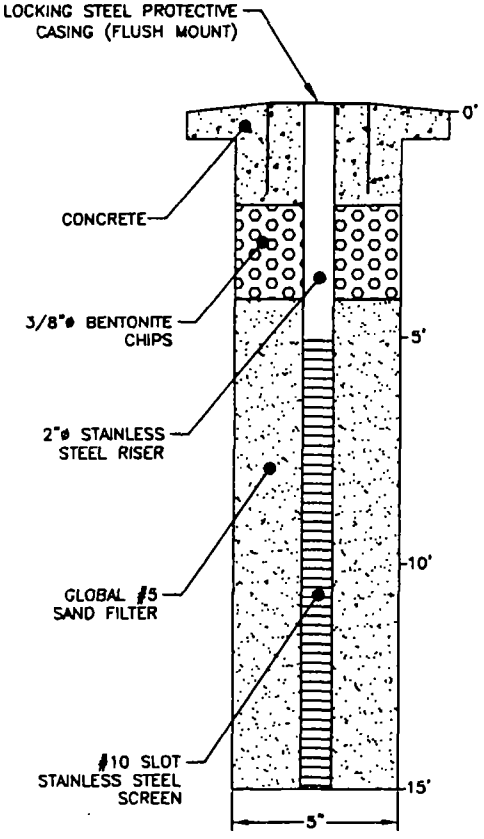
ISSUE DATE:

KEY ENVIRONMENTAL, INC.
200 THIRD AVENUE
CARNEGIE, PA 15106

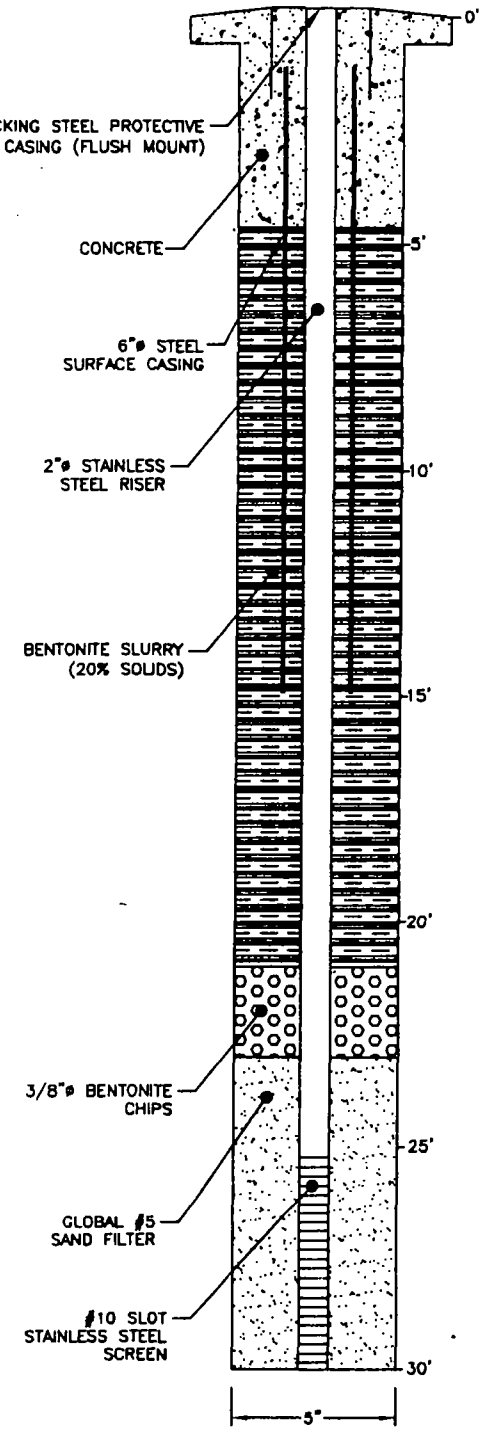
PROPOSED IWPZ MONITORING WELL AND ADDITIONAL NAPL RECOVERY LOCATIONS

PROJECT NO: 07-490

FIGURE 5



PROPOSED SWBZ MONITORING WELL CONSTRUCTION



PROPOSED IWBZ MONITORING WELL CONSTRUCTION

BEAZER EAST, INC.
PITTSBURGH, PENNSYLVANIA

DRWN: CRJ	DATE: 08/13/07	KEY ENVIRONMENTAL INCORPORATED
CHKD: PMB	DATE: 08/13/07	
APPD: TEJ	DATE: 08/13/07	
SCALE:	N.T.S.	

SUPPLEMENTAL INVESTIGATIONS
FORMER KOPPERS COMPANY, INC. SUPERFUND SITE
CHARLESTON, SOUTH CAROLINA

REFERENCE:	ISSUE DATE:	
	KEY ENVIRONMENTAL, INC. 200 THIRD AVENUE CARNEGIE, PA 15106	PROPOSED OIA SWBZ AND IWBZ PIEZOMETER CONSTRUCTION DETAIL

PROJECT NO: 07-490
FIGURE 3

APPENDIX G
Limited Warranty Deed
(Institutional Controls)

LIMITED WARRANTY DEED

KNOW ALL PERSONS BY THESE PRESENTS that **BEAZER EAST, INC.**, a Delaware corporation having an address c/o Three Rivers Management, Inc., Suite 3000, One Oxford Centre, Pittsburgh, PA 15219 (the "Grantor") for valuable consideration paid, does hereby give, grant, bargain, sell and confirm with limited warranty covenants unto **ASHLEY I, LLC, a South Carolina limited liability company**, having an address c/o Clement, Crawford & Thornhill, Inc., 476 Meeting Street, Suite E, Charleston, SC 29403 (the "Grantee"), the following described premises (the "Property"):

ALL THOSE CERTAIN PARCELS OF LAND containing 86.196 acres, more or less, situated in the City and County of Charleston, State of South Carolina, bounded and described as follows:

TRACT A/B-1

ALL that piece, parcel or lot of land, together with all the buildings and improvements thereon, situate, lying and being in the City of Charleston, State of South Carolina, and shown and designated as "TRACT 'A' 1.16 ACRES MILFORD STREET ASSOC." and as "B-1 0.30 ACRE" on a plat by Sigma Engineers Inc., dated October 14, 1980, entitled in part "PLAT OF THE RESUBDIVISION OF TRACTS "A", "B" AND "C" AS SHOWN. LOCATED IN THE CITY OF CHARLESTON, SOUTH CAROLINA" and recorded at Plat Book AR, Page 85, RMC Office for Charleston County, South Carolina.

Said lot have such size, shape, dimensions, buttings, boundings and location as will by reference to said plat more fully and at large appear.

The above described property having been conveyed to Beazer East, Inc. by deed of Milford Street Associates, I, a general partnership, dated October 28, 1993 and recorded October 28, 1993 at Book W-233, Page 626, RMC Office for Charleston County, South Carolina.

TMS #466-00-00-028

2001-2438

TRACT B/C-1

ALL that piece, parcel or lot of land, together with all the buildings and improvements thereon, situate, lying and being in the City of Charleston, State of South Carolina, and shown and designated as "TRACT 'B' 1.49 ACRES CHARLESTON PUBLIC WORKS" on a plat by Sigma Engineers Inc., dated October 14, 1980, entitled in part "PLAT OF THE RESUBDIVISION OF TRACTS "A", "B" AND "C" AS SHOWN. LOCATED IN THE CITY OF CHARLESTON, SOUTH CAROLINA" and recorded at Plat Book AR, Page 85, RMC Office for Charleston County, South Carolina.

Said lot have such size, shape, dimensions, buttings, boundings and location as will by reference to said plat more fully and at large appear.

The above described property having been conveyed to Beazer East, Inc. by deed of Commissioners of Public Works of the City of Charleston, dated May 23, 1997 and recorded June 24, 1997 at Book Y-285, Page 601, RMC Office for Charleston County, South Carolina.

ALSO

ALL that piece, parcel or lot of land, together with all the buildings and improvements thereon, situate, lying and being in the City of Charleston, State of South Carolina, and shown and designated as "TRACT C-1 0.29 ACRE" on a plat by Sigma Engineers Inc., dated October 14, 1980, entitled in part "PLAT OF THE RESUBDIVISION OF TRACTS "A", "B" AND "C" AS SHOWN. LOCATED IN THE CITY OF CHARLESTON, SOUTH CAROLINA" and recorded at Plat Book AR, Page 85, RMC Office for Charleston County, South Carolina.

Said lot have such size, shape, dimensions, buttings, boundings and location as will by reference to said plat more fully and at large appear.

The above described property having been conveyed to Beazer East, Inc. by deed of The Commissioners of Public Works of the City of Charleston dated March 5, 2003 and recorded March 7, 2003 in Book K-439, Page 859, RMC Office for Charleston County, South Carolina.

TMS #466-00-00-029

TRACT C

ALL that piece, parcel or tract of land, together with all buildings and improvements thereon, situate, lying and being in the City and County of Charleston, State of South Carolina, containing Three and 77/100 (3.77) acres, more or less, and shown and designated as "TRACT 'C' 3.77 ACRES, CITY OF CHARLESTON" on a plat entitled; "PLAT OF THE RE-SUBDIVISION OF TRACTS "A", "B" AND "C" AS SHOWN. LOCATED IN THE CITY OF CHARLESTON, S.C.", by Harold J. LeaMond, dated October 14, 1980 and recorded December 12, 1980, in Plat Book AR, Page 85, R.M.C. Office for Charleston County, S.C.

SAID TRACT having such size, shape, dimensions, buttings and boundings as will by reference to said plat more fully and at large appear.
The above described property having been conveyed to Beazer East, Inc. by deed of The City Council of Charleston, acting on behalf of The City of Charleston, dated November 24, 1998 and recorded December 29, 1998 at Book G-317, Page 133, RMC Office for Charleston County, South Carolina.

TMS #466-00-00-030

TRACT D

All that piece, parcel or tract of land, together with all buildings and improvements thereon, situate, lying and being in the City and County of Charleston, State of South Carolina, containing Ten and No/100 (10.00) acres, more or less, and shown and designated as "TRACT "D" 10.0 AC.", on a plat entitled: "PLAT OF THE ENLARGEMENT OF TRACT D FROM 5 AC. TO 10 AC., PROPERTY OF UNIVERSAL ENTERPRISES, INC. LOCATED OFF INTERSTATE NO. 26, CITY OF CHARLESTON, CHARLESTON COUNTY, SOUTH CAROLINA", by Harold J. LeaMond, dated March 17, 1982, and recorded April 28, 1982 in Plat Book AV, Page 52, R.M.C. Office for Charleston County, South Carolina.

SAID tract having such size, shape, dimensions, buttings and boundings as will by reference to said plat more fully and at large appear.

BEING a portion of the property conveyed to Grantor herein by deed of Paul A. Davis dated May 19, 1995 and recorded May 22, 1995 at Book P-255, Page 308, RMC Office for Charleston County, South Carolina.

TMS #466-00-00-031

TRACT I

ALL that certain piece, parcel or tract of land, together with all buildings and improvements thereon, situate, lying and being in the City and County of Charleston, State of South Carolina, containing one (1.0) acre, more or less, and shown and designated as "TRACT "I", 1.0 ACRE", on a plat entitled: "PLAT OF THE SUBDIVISION OF A 43.95 ACRE TRACT,. THE PROPERTY OF BRASWELL SHIPYARD, INCORPORATED, LOCATED ON U.S. INTERSTATE HIGHWAY NO. 26, CITY OF CHARLESTON, CHARLESTON COUNTY, S.C.", by Harold J. LeaMond, dated August 8, 1979, and recorded August 14, 1979, in the R.M.C. Office for Charleston County, S.C., in Plat Book AO, Page 11.

SAID tract having such size, shape, dimensions, buttings and boundings as will by reference to said plat more fully and at large appear.

BEING a portion of the property conveyed to Grantor herein by deed of Paul A. Davis dated May 19, 1995 and recorded May 22, 1995 at Book P-255, Page 308, RMC Office for Charleston County, South Carolina.

TMS #466-00-00-036

TRACT A-1

ALL that piece, parcel and tract of land, together with the buildings and improvements thereon, located in the City of Charleston, County of Charleston, State of South Carolina, containing 4.272 acres, more or less, and shown as Parcel A on a plat thereof entitled "Plat Showing the Subdivision of a 12.176 Acre Tract Owned by Hetafi, Inc., City of Charleston, Charleston County, S.C." by Engineering, Surveying and Planning, Inc. dated November 4, 1986, and recorded in the RMC Office for Charleston County in Plat Book BL at page 84, and together with concrete pier showing on said Plat, subject to the restrictions hereinafter contained, said conveyance made subject, in all respects, to easements and rights of way of record or shown on said Plat.

ALSO, the above-described 4.272 acre tract designated as PARCEL A is conveyed herein together with the fifty (50') foot access easement designated as "50' INGRESS/EGRESS EASEMENT" across "PARCEL B" and across the tract designated as "BRASWELL SHIPYARDS, INC., TAX MAP NUMBER 466-0-0, PARCEL 19" as said easement and two burdened parcels are shown on said Plat recorded in Plat Book BL, Page 84.

The 4.272 acre tract known as Parcel A is sold subject to, the restriction that the existing concrete pier shall not extend beyond a continuation of the southernmost east/west boundary of the property described herein and subject to this conveyance, which line constitutes a boundary line between the property referred to herein and other lands now or formerly of John T. Parker and Nina K. Parker.

BEING a portion of the property conveyed to Grantor herein by deed of Braswell Services Group, Inc., f/k/a Braswell Shipyards, Inc., dated June 24, 1994 and recorded June 24, 1994 at Book S-244, Page 549, RMC Office for Charleston County, South Carolina.

TMS #466-00-00-049

TRACT A-2

ALL that piece, parcel and tract of land located in the City of Charleston, County of Charleston, State of South Carolina, shown as "BRASWELL SHIPYARDS, INC., TAX MAP NUMBER 466-0-0, PARCEL 19" on a plat thereof entitled, "PLAT SHOWING THE SUBDIVISION OF A 12.176 ACRE TRACT OWNED BY HETAFI, INC., CITY OF CHARLESTON, CHARLESTON COUNTY, S.C." by Engineering, Surveying and Planning, Inc., dated November 4, 1986, and recorded in the R.M.C. Office for Charleston County in Plat Book BL, at Page 84, together with the buildings and improvements located thereon; said tract butting and bounding as shown on said Plat as follows: to the North on property now or formerly owned by Columbia Nitrogen Corp. (TMS Parcel 466-00-00-018); to the East on property now or formerly owned by Paul A. Davis (TMS Parcel 466-00-00--31); to the South and West on "PARCEL A" as

shown; subject to the easements and rights-of-way as shown on said Plat. Said parcel also is described and designated as parcel "5.20 ac. Owner Braswell Shipyards, Inc." on a plat prepared by Harold J. LeaMond, P.E. & R.L.S. S.C. Registration No. 2507 entitled "Plat Showing the Subdivision of a 17.87 Acre Tract The Property of Braswell Shipyards, Inc." dated July 29, 1982 and recorded in the RMC Office for Charleston County in Plat Book AW, Page 15 said property having such metes, bounds, buttings and boundings as will by reference to said plat more fully and at large appear.

ALSO the above-described tract is conveyed herein together with the fifty (50') foot access easement designated as "50' INGRESS/EGRESS EASEMENT" across "PARCEL B" as said easement and burdened parcel is shown on said Plat recorded in Plat Book BL, Page 84.

BEING a portion of the property conveyed to Grantor herein by deed of Braswell Services Group, Inc., f/k/a Braswell Shipyards, Inc., dated June 24, 1994 and recorded June 24, 1994 at Book S-244, Page 549, RMC Office for Charleston County, South Carolina.

TMS #466-00-00-019

TRACT F

All that piece, parcel and tract of land, together with the improvements thereon if any located in the City of Charleston, County of Charleston, State of South Carolina, containing 2.10 acres, more or less, and designated as Tract F on a plat by Harold J. LeaMond, P.E. and L.S., S.C. Registration No. 2507, entitled "Plat of Tracts K & F Located on U.S. Interstate Highway No. 26 City of Charleston" recorded in the RMC Office for Charleston County on April 30, 1982 in Plat Book AV at Page 62 and said property having such metes, bounds, buttings and boundings as will by reference to said plat more fully and at large appear.

BEING a portion of the property conveyed to Grantor herein by deed of Braswell Services Group, Inc., f/k/a Braswell Shipyards, Inc., dated June 24, 1994 and recorded June 24, 1994 at Book S-244, Page 549, RMC Office for Charleston County, South Carolina.

TMS #466-00-00-035

TRACT M-2

ALL that certain lot, piece or parcel of land, together with all buildings and improvements thereon, situate, lying and being in the City and County of Charleston, State of South Carolina, and containing 8.25 acres, more or less (being 5.35 acres of highland and 2.90 acres of marsh and lowland), and more particularly described as TRACT M-2 on a plat prepared by Sigma Engineers, Inc., entitled "PLAT SHOWING THE SUBDIVISION OF TRACT M INTO TRACTS M-1 AND M-2, THE PROPERTY OF BRASWELL SHIPYARDS, INC.", dated January 7, 1985, and duly recorded in the RMC Office for Charleston County, S.C., in Plat Book BC, Page 150. Reference to said plat

is hereby craved for a complete description as to distances, courses, metes and bounds.

BEING a portion of the property conveyed to Grantor herein by deed of Ashley Realty Co., Inc. dated December 30, 1993 and recorded January 7, 1994 at Book G-237, Page 689, RMC Office for Charleston County, South Carolina.

TMS #464-00-00-029

TRACT N

ALL that piece, parcel or tract of land, together with all buildings and improvements thereon, situate, lying and being in the City and County of Charleston, South Carolina, and being shown and designated as "Tract N", containing 48.41 acres total, more or less, on a plat by Harold J. LeaMond of Sigma Engineers, Inc., dated January 21, 1983, and entitled "PLAT OF TRACTS M & N, THE PROPERTY OF BRASWELL SHIPYARDS, INC., CITY OF CHARLESTON, CHARLESTON COUNTY, SOUTH CAROLINA", and recorded at Plat Book AW, Page 181, R.M.C. Office for Charleston County, South Carolina, and having such size, shape, buttings, boundings, dimensions and location as will appear by reference to said plat which is incorporated herein by reference, be all the dimensions and measurements shown thereon a little more or less.

Butting and Bounding according to said plat north on property now or formerly of Carolina Dry Docks, Inc.; to the east on Tract M; to the south on property now or formerly of The Charleston Oil Company; and to the west on the edge of marsh of the Ashley River.

Together with all right, title and interest of the Grantor in and to the "pier" shown on the above said plat extending from the within described real property into the Ashley River.

BEING a portion of the property conveyed to Grantor herein by deed of Ashley Realty Co., Inc. dated December 30, 1993 and recorded January 7, 1994 at Book G-237,Page 689, RMC Office for Charleston County, South Carolina.

TMS #464-00-00-012

It is the intention of Grantor to convey all interest of Grantor in real property at each of the locations which are described herein, however acquired, including but not limited to all rights of access, commercial rights, transferable easements (of whatever nature), appurtenances and rights in and to adjacent streets, roads and ways, whether public or private. It is the intention of Grantor to convey all interest in real property in the Neck area of Charleston County, S.C. and located in the area of Braswell Street and Milford Street, however acquired.

UNDER AND SUBJECT to all reservations, encumbrances and restrictions set forth on **Exhibit "A"** attached hereto and made a part hereof, and the following restrictive covenants:

GRANTEE COVENANTS, on behalf of itself, its affiliates and related companies, as well as its and their successors and assigns, as well as all current and future owners and occupiers of the Property (all of the above-listed persons whom are hereinafter collectively referred to as the "Site Occupiers"), that it and the Site Occupiers will limit the use of the Property to any commercial or industrial uses (but specifically excluding any residential use), or parking, that the Property shall not be used for any other purpose, that no groundwater wells of any kind or nature shall be installed in, or used at, the Property, and that Grantee will comply with the use and other restrictions set forth in Exhibit "A" hereto, the provisions of which Exhibit shall inure to and be binding on the heirs, successors and assigns of Grantor and Grantee and run with the land; provided, however, that violation of any covenant or limitation of use shall not cause a forfeiture or reversion of title.

TOGETHER with all and singular the rights, members, hereditaments and appurtenances thereunto belonging, incident or appertaining.

TO HAVE AND TO HOLD the above granted and bargained premises, with the privileges and appurtenances thereof, unto the Grantee, its successors and assigns forever, to its and their own proper use and behalf, in fee simple.

AND FURTHERMORE, the Grantor, does by these presents bind itself, its successors and assigns forever, to warrant and defend the above granted and bargained premises to the Grantee, and to its successors and assigns, against the claims and demands made or suffered by the Grantor, and by successors and assigns

of Grantor, lawfully claiming or to claim the same or any part thereof, except as aforesaid, but against none other.

IN WITNESS WHEREOF, the undersigned has hereunto set his hand on behalf of the Grantor this 15th day of July, 2003.

WITNESSES:

~~Asst. Secretary~~

~~Sally M. Karanzas, Asst. Secy.~~

GRANTOR:

BEAZER EAST, INC.*

By: Jill M. Blundon

Name: Jill M. Blundon, Vice President

Title:

ACKNOWLEDGMENT

STATE OF PENNSYLVANIA)
COUNTY OF ALLEGHENY)

I, SALLY M. KALANZAS, a Notary Public within and for the State of PENNSYLVANIA, duly commissioned and acting, do hereby certify that on this 15TH day of JULY, 2003, personally appeared before me JILL M. BLUNDON, to me personally known to be the person who signed the foregoing Limited Warranty Deed on behalf of Beazer East, Inc. being duly sworn and being informed of the contents of said instrument, stated and acknowledged under oath that ~~he~~/she is the Vice President of Beazer East, Inc.* a Delaware corporation and, as such, is a duly certified individual who may enter into agreements on behalf of each entity. Moreover, he/she has acknowledged that the entity has executed the same as its free act and deed and was voluntarily executed by himself/herself, on behalf of said entity, for the purposes and consideration therein mentioned and set forth.

WITNESS my hand and seal as such Notary Public the day and year above written.

(SEAL)

My Commission Expires: 4-27-07

Notary Public for Allegheny Co., PA

Notarial Seal
Sally M. Karanzas, Notary Public
City Of Pittsburgh, Allegheny County
My Commission Expires Apr. 27, 2007
Member, Pennsylvania Association Of Notaries

EXHIBIT "A" to Limited Warranty Deed

EXCEPTIONS TO TITLE AND USE RESTRICTIONS

1. The lien of real property ad valorem taxes for the year of closing, not yet due and payable; Charleston County User fees, if any, for the year of closing, not yet due and payable.

2. Encumbrances, easements and restrictions of record.

3. Water, sewer, gas, electric, cable television, telephone and railroad lines as currently installed.

4. Unrecorded easements, discrepancies or conflicts in boundary lines, shortages in areas and encroachments which a complete and accurate survey would disclose.

5. Limitations of use currently in effect or imposed in the future by a governmental authority.

6. Taxes and sewer use charges for periods subsequent to the date hereof.

7. Riparian rights of others to any water courses in, on, crossing or bounding said Property.

8. The following leases in effect as of the Closing Date.

   a) Lease to Parker Marine Contracting Corp. dated October 25, 2002. [4.5 acres located on Tracts A-1 and A-2]

   b) Lease to Superior Transportation, Inc. dated July 16, 2001. [6.18 acres located on Tracts A/B-1, B/C-1 and C]

   c) Lease to Kirkman Broadcasting, Inc. dated February 1, 2000. [0.75 acres located on Tract N]

   d) Lease to Boasso America Corporation dated January 25, 2000. [6.11 acres located on Tract M-2 and N]

9. Grantee acknowledges and understands that Grantor operated a wood treating plant on the Property, that the Property was used for other industrial purposes, that Grantor and others utilized numerous chemicals, materials and compounds in the operation of such facilities on the Property and that hazardous substances and chemical residues, constituents, materials and compounds exist in, on and about the Property. Grantee also acknowledges that the Property is the subject of a Unilateral Administrative Order ("UAO") between Beazer East, Inc. and the U.S. Environmental Protection Agency ("EPA").

10. Grantee will use the Property only for commercial or industrial purposes (specifically excluding residential uses).

11. Grantee will not use groundwater at the Property for any use whatsoever.

12. Grantee's use of the Property shall be restricted in that Grantee shall not destroy, damage or interfere with any monitoring wells, piezometers, or other

environmental remediation equipment, installations or other work on the Property relating directly to groundwater, including the cap on sediment in a portion of the Ashley River adjacent to or near the Property ("the Sediment Cap"), now or in the future without the prior written consent of the Grantor, which consent will not be unreasonably withheld. Grantee will be responsible for repairing or replacing, at its expense, any environmental remediation equipment, installations or other work relating to soils or groundwater, including the Sediment Cap, that Grantee damages or destroys.

13. If Grantee conducts any construction work on the Property involving excavation of site soils, Grantee will obtain all necessary permits and regulatory approvals for such work, including any required approval from the EPA, and Grantee will conduct all such work in compliance with such permits and approvals, the UAO and all applicable laws, rules and regulations, all at Grantee's sole cost and expense. Grantee will be solely responsible for all costs associated with the excavation of site soils.

14. Grantee will release Grantor from, and defend and indemnify Grantor from and against any claims and damages Grantor suffers arising from Grantee's work on the Property, including the Sediment Cap.

15. Grantee shall be and remain responsible for operating, maintaining, monitoring and reporting on all environmental equipment, features, and remedial work constructed or installed by Grantor on or relating to the surface of the Property, including but not limited to the Sediment Cap, drainage systems, soil caps and

soil covers, but not including such equipment or work as is intended to address groundwater conditions. In operating, maintaining, monitoring and reporting on such systems, Grantee shall comply with the UAO and all applicable local, state or federal laws, rules, regulations and orders. Grantee shall copy Grantor on any reports on such systems that it files with a governmental authority. Grantee's obligations as set forth in this paragraph shall terminate at such time as no further action by Grantee as contemplated by this paragraph is required of either Grantor or Grantee by the UAO and applicable local, state and federal laws, rules, regulations and orders. Such termination may be evidenced by Grantor, Grantee or Grantee's successors in title, recording in the land records of Charleston County, South Carolina, official action of the EPA and applicable South Carolina regulatory authorities confirming that no such further or continuing action by Grantor or Grantee is required with respect to the Property under applicable laws, rules, regulations or orders; provided, however, that there shall be no requirement of any such recordation as a condition to the termination of Grantee's obligations.

16. Grantee shall cooperate with Grantor in Grantor's performance of any and all environmental investigations, removals and remediation work on the Property that is required by the UAO or applicable local, state or federal laws, rules, regulations or orders. Such cooperation will include, but not be limited to, reasonable access to and through all portions of the Property by Grantor, Grantor's contractors and consultants, the governmental authorities and their employees, agents or representatives, all at no cost to Grantor. Grantor shall use its best efforts to exercise its access rights under this paragraph so as to

minimize interference with the operation of any business or activities of Grantee on the Property.

17. In fulfilling Grantor's obligations under the UAO or other order relating to the Property, Grantor shall have the sole and exclusive right to negotiate and deal as it sees fit with the EPA and any other governmental authorities.

18. Grantor will not enter into any agreement or settlement with the U.S. EPA or other governmental authorities that may affect Grantee's obligations with respect to the Property or Grantee's right to use the Property as contemplated by this Deed without the prior written consent of Grantee, which consent shall not be unreasonably withheld.

19. The provisions of the Deed and this exhibit thereto shall inure to and be binding on the heirs, successors and assigns of Grantor and Grantee.

STATE OF SOUTH CAROLINA)
COUNTY OF CHARLESTON) **AFFIDAVIT**

Date of Transfer of Title
Closing Date: July 29, 2003

PERSONALLY appeared before me the undersigned, who being duly sworn, deposes and says:

1. I have read the information on this Affidavit and I understand such information.

2. The property is being transferred BY BEAZER EAST, INC. TO ASHLEY I, LLC, a South Carolina limited liability company ON July 29, 2003.

3. Check one of the following: ***The DEED is***
   (a) ___X___ subject to the deed recording fee as a transfer for consideration paid or to be paid in money or money's worth.
   (b) _____ subject to the deed recording fee as a transfer between a corporation, a partnership, or other entity and a stockholder, partner, or owner of the entity, or is a transfer to a trust or as a distribution to a trust beneficiary.
   (c) _____ EXEMPT from the deed recording fee because (exemption #_____) (Explanation, if required)_____
   (If exempt, please skip items 4-6, and go to item 7 of this affidavit.)

4. Check one of the following if either item 3(a) or item 3(b) above has been checked.
   (a) ___X___ The fee is computed on the consideration paid or to be paid in money or money's worth in the amount of $4,611,000.00.
   (b) _____ The fee is computed on the fair market value of the realty which is $_____
   (c) _____ The fee is computed on the fair market value of the realty as established for property tax purposes which is $_____.

5. Check YES _____ or NO ___✓___ the following: A lien or encumbrance existed on the land, tenement, or realty before the transfer and remained on the land, tenement, or realty after the transfer. If "YES," the amount of the outstanding balance of this lien or encumbrance is $_____.

6. The DEED Recording Fee is computed as follows:
   (a) $4,611,000.00 the amount listed in item 4 above
   (b) 0 the amount listed in item 5 above (no amount place zero)
   (c) $4,611,000.00 Subtract Line 6(b) from Line 6(a) and place the results.

7. As required by Code Section 12-24-70, I state that I am a responsible person who was connected with the transaction as: Grantee.

8. Check if Property other than Real Property is being transferred on this Deed.
   (a) _____ Mobile Home
   (b) _____ Other

9. _____ DEED OF DISTRIBUTION - ATTORNEY'S AFFIDAVIT: Estate of _____ deceased CASE NUMBER _____. Personally appeared before me the undersigned attorney who, being duly sworn, certified that (s)he is licensed to practice law in the State of South Carolina; that (s)he has prepared the Deed of Distribution for the Personal Rep. in the Estate of _____ deceased and that the grantee(s) therein are correct and conform to the estate file for the above named decedent.

10. I understand that a person required to furnish this affidavit who willfully furnishes a false or fraudulent affidavit is guilty of a misdemeanor and, upon conviction, must be fined not more than one thousand dollars or imprisoned not more than one year, or both.

SWORN this 29th day of July, 2003

William G. Bodie (SEAL)
Notary Public for South Carolina
My Commission Expires: 10-7-2007

SIGNED: [signature]
Grantor, Grantee, or Attorney that prepared this form

Robert L. Clement III
Type or Print Name here

BK H457PG736

RECORDER'S PAGE

This page Must remain with the original document.

YOUNG, CLEMENT, RIVERS, & TISDALE LLP

Recording Fee	20.00
State Fee	11,988.60
County Fee	5072.10
Postage	
TOTAL	17,080.70

A

RECEIVED FROM RMC
AUG 04 2003
PEGGY A. MOSELEY
CHARLESTON COUNTY AUDITOR

FILED
W457-722
2003 JUL 17 AM 9:33
CHARLIE LYBRAND
REGISTER
CHARLESTON COUNTY SC

PID VERIFIED BY ASSESSOR
REP MMG
DATE 8/1/03